News and Views

in the Biological Sciences

THE AIBS BULLETIN

MAY 5 1960

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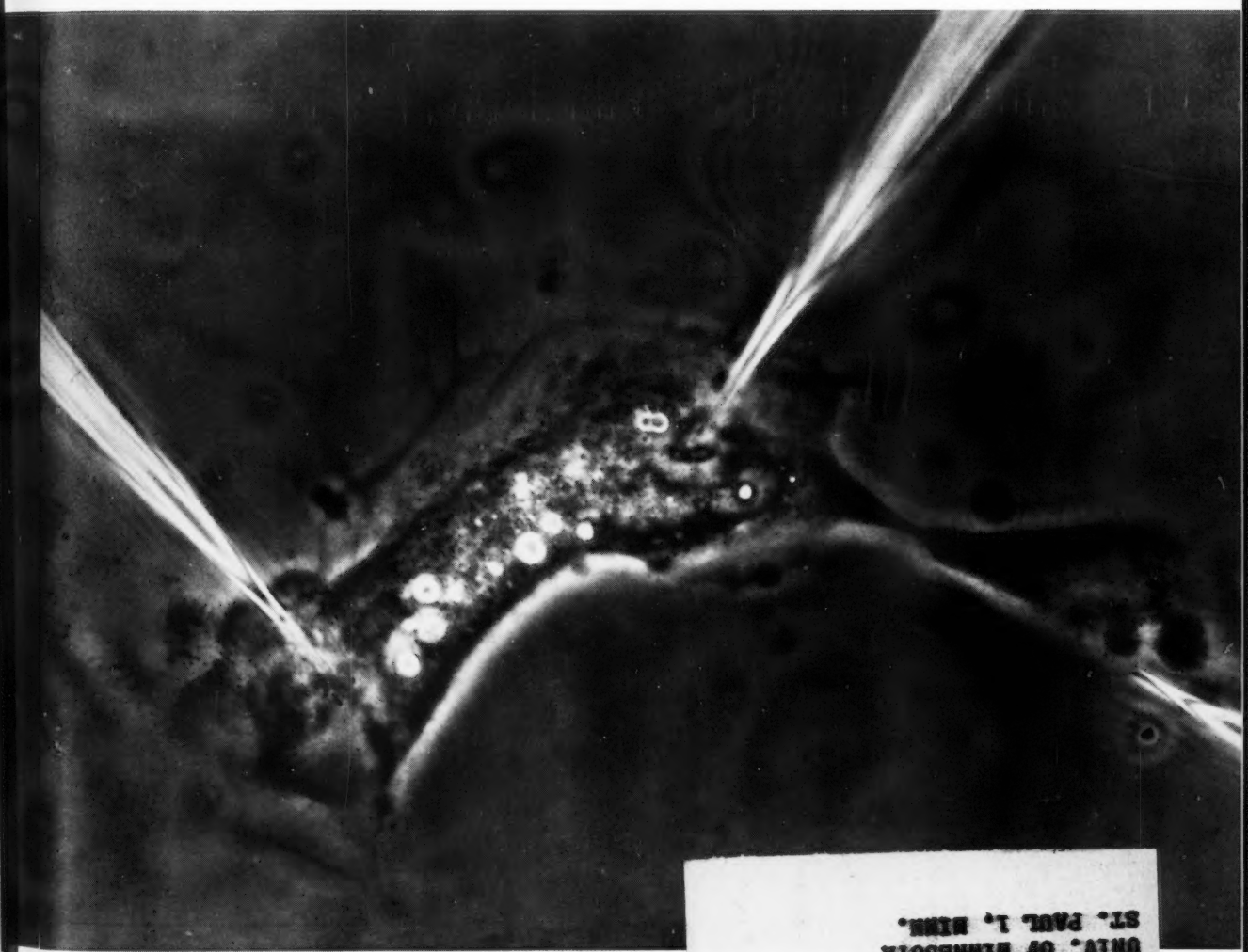
April, 1960



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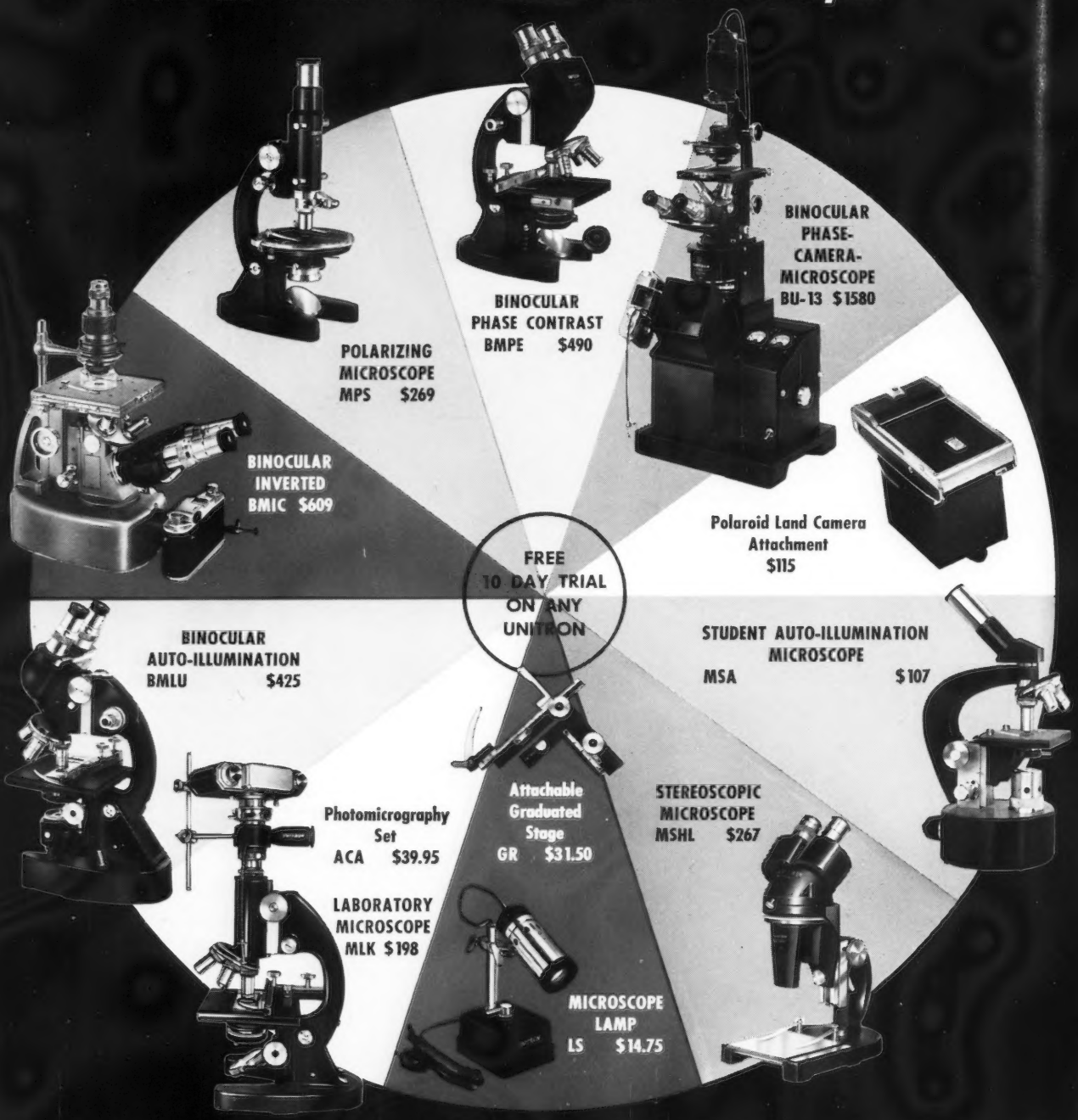
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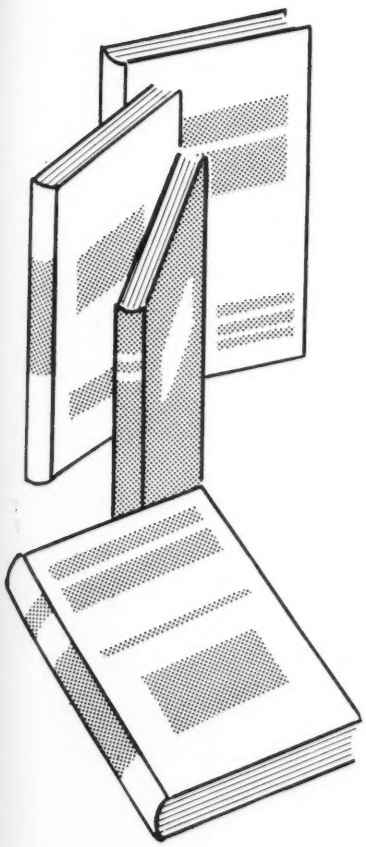

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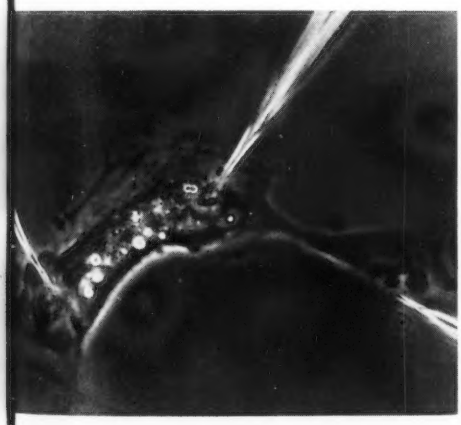

Cover Picture: DISSECTION OF THE NUCLEOLUS. Living adenocarcinoma cell from frog kidney in tissue culture. Central micro needle in nucleolus with possible virus aggregates. (Approx. 450X.) In amphibious tumors of this type a DNA-virus stimulates nucleolar hyperactivity. Photo by: Dr. William R. Duryee, The George Washington University School of Medicine, Washington, D.C.

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The AIBS Bulletin is published 6 times a year in February, April, June, August (Program), October, and December. Copyright 1960 by the American Institute of Biological Sciences, 2000 P Street, N.W., Washington, D.C. Subscription prices: $3.00 a year (Single copy; $1.00) and to Affiliate Members $1.50 a year; Canada, South America & Central America, $3.50; all other foreign, $4.00.

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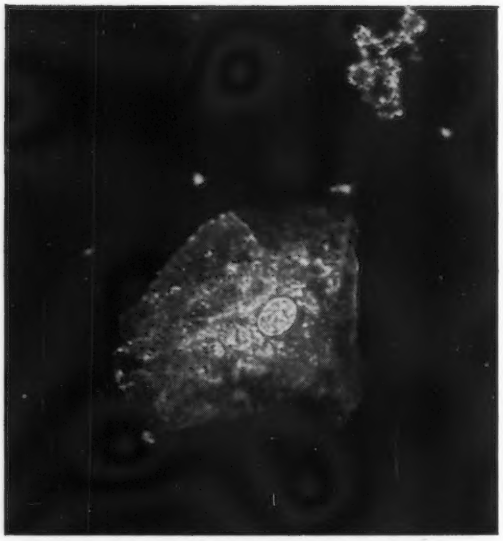
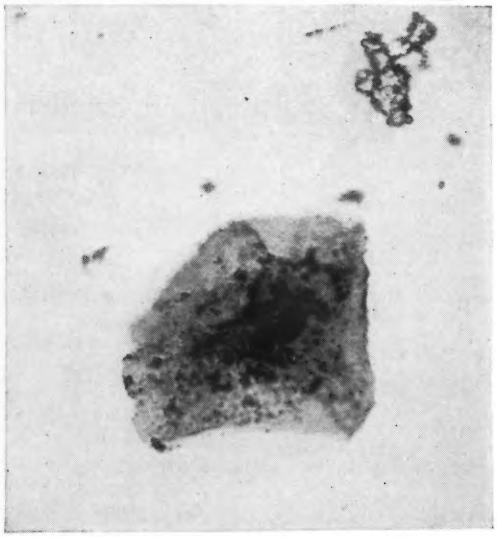


1. First, as shown in the photomicrograph* above, the microscope analyzer was rotated until the background was brought to extinction. Readings were taken directly from the analyzer scale. Averaged settings resulted in reading of 70.4°.



2. Next, the analyzer was rotated until the nucleus of the cell was brought to extinction. Averaged settings resulted in reading of 138.2°.

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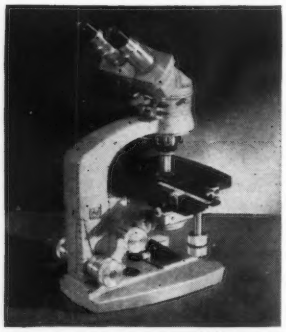

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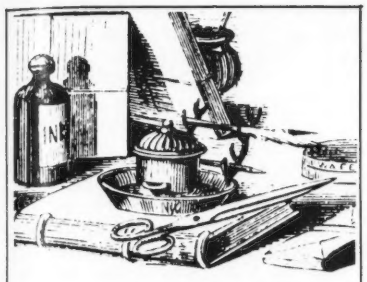

LETTERS

March 4, 1960

I am quite interested in the article by W. C. Grant, Jr. and G. B. Saul, II, on a curricular "Straw Man" for biologists which appeared in the February 1960 issue of the AIBS *Bulletin*.

Indeed, the present trend of "Biology" leaning toward the quantitative and kinetic aspects calls for sound bases in mathematics, statistics, chemistry and physics in the training of a modern biologist.

While the proposed program shown on page 17 of the *Bulletin* offers courses to strengthen the student's ability to grasp the principles of modern biology, the introductory mathematics and the included courses in chemistry are quite deficient for the understanding of biology at the molecular level. Hence, I should like to suggest that advanced mathematics (2) be included in the second year, biological and physical chemistry (2) be included in the third year, and kinetics of molecular biology in the fourth year.

Shih L. Chang
Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

February 14, 1960

As a member of the AIBS may I suggest that the *Bulletin* advise Institute members of House Concurrent Resolution 433 which states: "Resolved: That the Congress hereby reaffirms the longstanding policy of the U.S. that in the event of war the U.S. shall under no circumstances resort to the use of biological weapons or the use of poisonous or obnoxious gases unless they are first used by our enemies."

Rep. R. Kastenmeier, who introduced this resolution last September, states that he did so because of "the efforts of certain segments of the Defense Department to have the United States change its basic position in regard to the use of gas and germ warfare. That position has long been that only if an enemy used these weapons against us in wartime would we employ them ourselves. . . . I believe the moral position of the United States requires that we not use such weapons unless others use them first. . . . These agents are sufficiently dangerous that, from military research into biological and chemical weapons, three deaths have resulted."

Surely, this resolution is of the greatest concern to biologists, and yet there has been almost no discussion among biologists or in professional journals of the issues posed by military use of medical and other biological knowledge. This is in marked contrast to the attitude taken by physicists regarding the use of nuclear physics by the military. I believe that it is time that biologists faced the social implications of certain aspects of their work, and consideration of the present resolution in Congress would seem to be a timely means of promoting discussion.

I trust that you can give the above resolution some publicity, and I am sure that Representative Kastenmeier will supply you with his exhaustive material on the problem of BW, if you should care to look into the situation in more detail.

E. W. Pfeiffer
Dept. of Zoology
Montana State University
Missoula, Montana

February 29, 1960

The wonderful and refreshing blast from Fred R. Cagle in the February AIBS *Bulletin* hits me at a very appropriate time of despondency. Let me be the first to congratulate you on publishing it, and to urge you to place action on the problems high in your agenda.

Actually I think the Achilles heel of the situation is the editorship of these multifarious journals. The editors seem in most cases to be impelled by egoistic motives, and even if the journal is losing money or driven to publishing nauseating drivel the editor carries on nobly. Any other journal but his is superfluous. Whether his editorial board functions or not, he is the kingpin. I realize that we can't do much about the foreign journals, but here is my suggestion just to start the ball:

I think the AIBS *Bulletin* should run a listing in each issue of journals by fields, giving a condensed itemization of such data as country of publication, whether the editor is permanent or not, number of pages annually, etc., and especially a poll of people in the field on their opinion of whether the journal is useful, useless, or what.

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If a high proportion of those polled agree that the journal in question is useless, the editor's ego may be punctured more effectually than any other way.

Perhaps I am atypical, but I have found no need to present any research other than review papers in over 25 pages. Mostly three to five pages are sufficient. Long involved discussions seldom are warranted. I get disgusted wading through pages of twaddle trying to decide where is the real meat of a paper.

Just a final word—I certainly do not want to be put down as one of those who would discourage 90% of the publication in biology. I have sometimes had difficulty getting a meticulously worked-out paper accepted myself, and I know how saddening that can be. I understand that some persons in that predicament have started their own journals in order to overcome the constipation. I think there ought to be a special huge pulp-paper journal to take papers which editors don't like, papers to be published without editorial change (punctuation, spelling, grammar, idiocy and all) at the author's risk.

When will AIBS *Bulletin* be consolidated with *Science?*

W. F. Hollander
Department of Genetics
Iowa State University
Ames, Iowa

March 13, 1960

My name is John M. Olive. I'm going to be a scientist just like you are. I found a cat skelaton. I also have a rat skull. We have a Congo Ell. I've cut open one bird, three frogs, and a lot of misquito hawks. I also have dinosaur models. There is the Brontosaurus, Tyranosaurus Rex, American Mastodon, Neanderethal Man, and the Stegosaurus. My address is 1505 Carter St., Orange, Texas.

Yours truely,
John Olive
Age, nine

January 5, 1960

A year or more ago I wrote to you concerning certain inadequacies of the society membership lists maintained by AIBS. This letter deals with the same subject, but it is somewhat different in nature.

It seems to me that enough time has now elapsed since the installation of this new system that it has been well tested. That system, in my opinion, is excellent. In fact, it is better than I thought it was possible to make it in view of the inherently difficult nature of the job. On several occasions I have been amazed at the promptness with which changes are made, and I have yet to encounter a single error. Once I sent in several address changes only two days before I ordered a set of gummed labels. I was much surprised to find that the changes were on the labels I received!

I have a strong suspicion that the smoothness and efficiency with which the systems seems to be working is to the credit of the register supervisor, Miss Joan V. Batterton, but certainly the entire AIBS organization deserves congratulations for its development and success.

Harold J. Humn, Secretary
Association of Southeastern Biologists

March 19, 1960

Professor Cagle, (Increase of Biological Serials—A Destructive Trend? AIBS *Bulletin*, Feb. 1960) although his title is interrogative, obviously believes that the increase in biological journals is indeed destructive. I feel sure that many of his readers have found his suggestions for the reversal of this trend to be of a far more menacing nature.

The two principal points with which Dr. Cagle involves himself are: the present difficulty of the biologist in maintaining contact with a literature scattered over dozens or even hundreds of different journals published by almost as many different organizations; the lack of economy inherent in what amounts to many small publishing projects rather than a few larger ones.

That inconvenience does exist cannot be denied. As I share residence with the Professor in a city which, like most others, does not possess a top-notch scientific collection, the difficulty is ever apparent. However, the suggestion that journal consolidation would be a solution is open to suspicion. If, as is presumably the case, the actual bulk of the writings is not to be lessened, then the new consolidated journals would have to be published in parts or series, and smaller (that is, most) libraries would economize by taking only those parts in which their faculty members and students had the greatest interest. If it is the intent that consolidation reduce the actual magnitude of writings, as would be the fact, whether it was the intent or not, then there can be no question that it is decidedly destructive.

In a positive way it would be better to think about the establishment of a really satisfactory system of abstracting—one no more than six months behind, complete, and usefully indexed and arranged. Too, to work toward the development of proper scientific

libraries on a regional plan so that we might not have to look for complete sources to a few, often distant, cultural centers.

Though economy might seemingly be served by consolidation, this appearance may not be consistent with the realization. At present many highly specialized journals are printed in runs under one thousand. If this material is to be distributed with other matter serving a larger audience, then the pages now printed in numbers of hundreds, might find themselves printed in tens of thousands and distributed to a large audience to whom they have no interest and merely lessen the utility of the journal in which they appear.

Professor Cagle reaches some of his conclusions upon the basis of a survey of 213 biologists. Even assuming that this was a proper sample, the finding that 35 of this number, 16 per cent, have original matter for which no outlet can be found is proof rather that the number of existing outlets is too small, not that it is too large. Some of us, apparently, in joining together in large omnipresent organizations, as perhaps the AIBS, are losing sight of our own best interests—and hence of the interests of all dependent upon our science. In reducing the "market" through which we dispose of our production, we would be, in a very practical manner, worsening our standing.

I should hope that the number of outlets would so increase (for all the reasons given in the article) that our writings might actually be sought after competitively and that we might at least look to occasional kind words from our publishers, if not that material recompense which most other authors enjoy.

The increase in biological serials—CONSTRUCTIVE!

Harry Darrow Brown,
Assistant Professor,
Loyola University,
New Orleans, Louisiana

Allow us to thank you for the good notice you gave to the announcement of grants and awards of The Lalor Foundation available for 1960 as printed in the November 1959 issue of the AIBS *Bulletin*.

It may interest you that this notice has already resulted in a generous number of requests for applications not only from Americans but from people abroad.

Yours sincerely,
C. Lalor Burdick
Director, The Lalor Foundation
Wilmington 5, Delaware

Genetic Basis of Morphological Variation

APPLICATION OF A TWIN ANALYSIS

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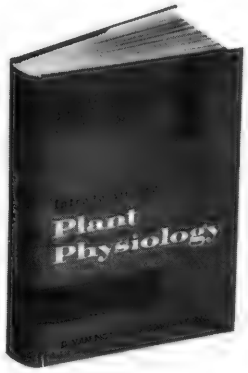

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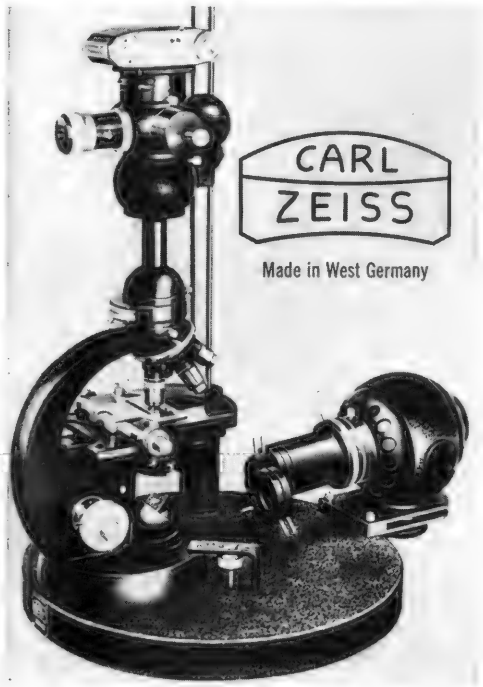

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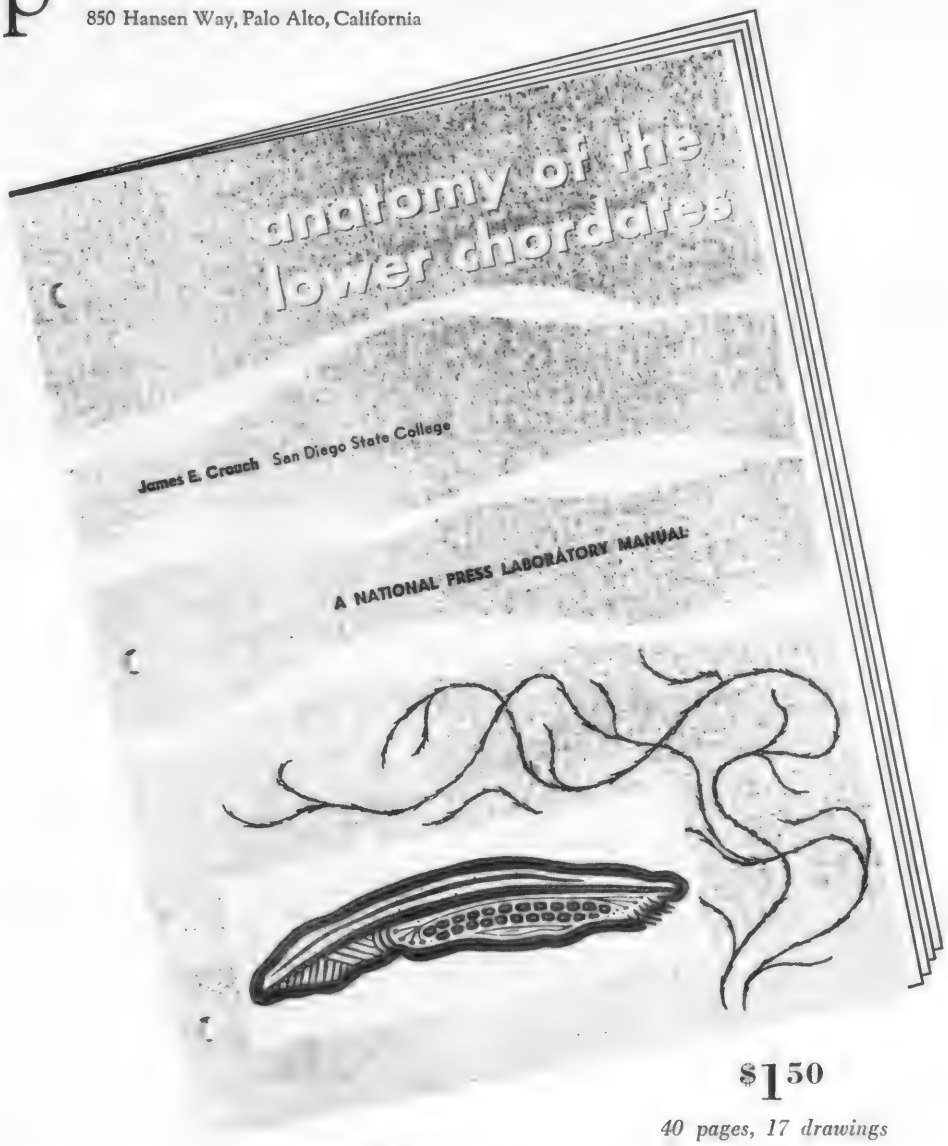

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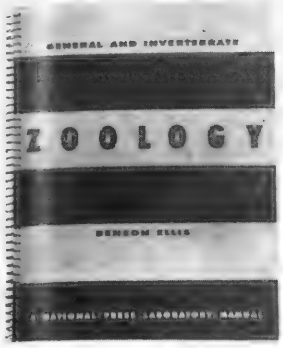

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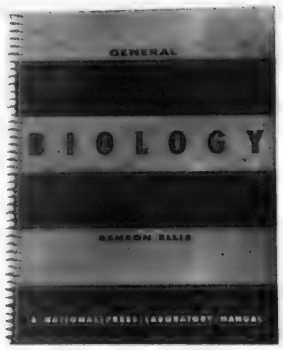

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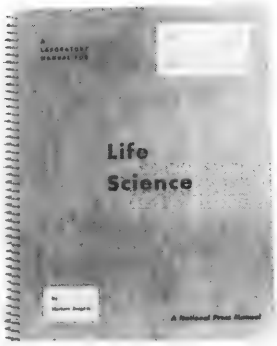

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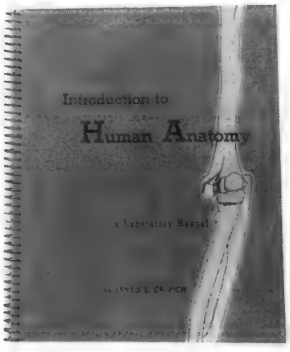

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The Overseas Chinese Daily, frequently a voice of the Communist Chinese regime, recently carried a headline which is reproduced here. I am told that a reasonably accurate translation is, "Scientific Research Forces Strong in China." The article so headlined carries its share of ideological payola but it cannot be written off as only propaganda. If claims made are even fairly accurate, then the Peking government has accomplished some minor miracles in scientific research and education.

The Chinese claim that there are now 580,000 students in mainland universities in the fields of pure science, engineering, agriculture and medicine. There is said to be a total faculty strength of 50,000 in these fields. Institutes of higher learning are supposed to have established more than one thousand research laboratories within the last two years and to have "produced thousands of scientific papers."

Discounting political overtones or nationalistic pride which may be reflected in these data, it is clear that a new and important producer of scientific research is emerging. We cannot and should not ignore what our Chinese colleagues are doing. The observation that science is not contained by political boundaries is trite but true.

For more than a year before Soviet scientific prowess was so dramatically demonstrated, the AIBS had sponsored an information exchange program between Soviet and United States biologists. Several of the better known Soviet biological journals were in cover-to-cover English translation in a project supported by the National Science Foundation. Seven of these journals are now sponsored by the AIBS and quite a number of individual books and monographs have been or are being translated. Comparatively little is now being translated from Chinese into English and there are many who consider mainland Chinese research too inconsequential to warrant even the little that is done. This is quite possible, of course, but not if one places credence in the article quoted above. Perhaps we should take another look.

The AIBS proposes to establish a modest program in translation of mainland Chinese biological materials. The consensus of well-informed persons both in this country and in Asia is that few, if any, journals now merit cover-to-cover translation. The problems, rather, are ones in selecting and translating articles of more than just passing interest, in preparing critical review articles, and in informing English speaking biologists of the lines of research their Chinese colleagues are following. The AIBS project briefly, would produce the following:

1. translated tables of contents of as many Chinese biological journals as can be obtained,
2. translations of specific articles as demand for them develops,
3. critical review articles on the status of Chinese research in major biological disciplines.

Such a program seems to embody the barest essentials needed for us to learn what our mainland Chinese colleagues are contributing to biological science. Certainly it is to be hoped that eventually there can be free exchange of basic scientific information between mainland China and the United States as there now is, or should be, between scientists of the rest of the world.

HIDEN T. COX

A description of planned facilities for biological research, and a request for suggestion and comments

Bostwick H. Ketchum

Woods Hole Oceanographic Institution

The New Oceanographic Research Vessel

THE WOODS HOLE Oceanographic Institution is proceeding with its development of plans for an oceanographic research vessel. Funds for the design and construction of this ship have been made available by the National Science Foundation.

The total complement of the ship is planned as 39 men, of whom 15 to 19 will be in the scientific party. The ship will be about 1,000 tons, approximately 175 feet long, and will have a cruising radius of about 7,000 miles.

Biological research at sea imposes many problems in the design of the vessel, particularly because of the wide variety of programs which may be undertaken. This brief statement of the special facilities proposed for the new ship has been prepared to inform the biologists of the type of facilities which will be available and to request their comments and suggestions concerning additional needs which may not have been included.

Scientific Space

At the present stage of planning it appears possible to reserve 50% of the total area of the ship for scientific purposes. This will include deck areas, laboratory spaces, and living quarters. The remainder will be for ship operations, engine room, crew quarters, mess halls, etc.

Preliminary plans call for about 1,700 square feet of enclosed laboratory space. Both wet and dry laboratories are planned. Between one-quarter and one-third of this enclosed laboratory space will permit installation of permanent equipment such as echo sounders, navigational aids, etc. The remainder will be used for removable equipment so that for each cruise at least 1,000 square feet of laboratory space will be available for installation of whatever special equipment is needed. A chemical type bench will be available with vacuum lines and supplies of gas, compressed air, nitrogen or tank gas, and fresh and salt water.

Preliminary plans provide for about 3,000 square feet of open deck to be available for scientific use. The main deck aft will be large enough to permit the use of large nets and trawls. Sufficient uninterrupted deck will be available to permit handling of a bottom core 80 to 100 feet long, or for other long equipment.

Separate structures, of about trailer truck size, which can be moved on and off the ship easily and quickly secured in place are being considered. Such a portable lab could be fully equipped ashore between cruises and be all ready to mount when the ship arrives in port. All radio isotope studies will probably be confined to such a portable lab to avoid background contamination of the permanent laboratories of the ship.

Winches and Wire

Slow speed control and maneuverability of the ship are especially important for towing plankton nets and for dredging. Provision will be made for continuous and gradual speed control from less than one knot to full speed (about 12 knots). In addition, some type of bow propulsion is being seriously considered which would permit a very short turning radius at slow speed and should make maneuvering relative to the wire overboard much easier.

Speed Control

Several winches with wire comparable to standard hydrographic wire (5/16″ diam.) and one main trawl winch with heavier (⅜-½″) wire will be provided. At least one winch will be equipped with electrical conducting armoured cable—either the one conductor or four conductor so-called "well logging" cable. This will permit direct recording on deck of depth of the bottom of the wire, and *in situ* operations such as the opening and closing of nets when the appropriate depth is reached.

Special Equipment

A completely independent, non-toxic running salt water system is being provided. One or more taps will be available in each lab, and at appropriate places on deck for rinsing of plankton nets.

One laboratory will be provided with running sea water aquaria. At present six aquaria, each about 3′ x 3′ x 4′, are contemplated with individual and separate temperature control. Collected organisms could thus be maintained at the temperature of their natural habitat.

A walk-in deep freeze for scientific purposes will be provided. This will be ample in size to freeze large fish and will provide storage space for large numbers of samples frozen for preservation or for chemical analysis. One section of this will be for quick freezing.

A bulbous bow, large enough for two observers, with underwater observation ports is being considered. The ports would be 10 to 12 feet below the waterline and should provide a good opportunity for observation of fish behavior as well as some possibility of observing equipment in operation underwater.

A center well, about 3′ x 4′ or larger, extending from the upper deck through the hull is being considered. In addition to being useful for lowering equipment into the water from enclosed spaces, several biological uses for this are apparent. These range from the possibility of using this space as a live well by closing the bottom with an appropriate grating, to its use by skin divers who could enter the water more safely under cold or adverse conditions.

Every effort will be made to keep the operation of the ship as quiet as possible. Complete silence—*i.e.* silent ship operation—will be provided for by battery banks adequate for several hours. This is essential for various geophysical studies but will also make it possible to monitor biological noises.

Any comments concerning biological requirements for this ship which have been overlooked should be sent to Dr. Bostwick H. Ketchum or to Mr. Frank Minot of the Woods Hole Oceanographic Institution. Our purpose is to make this ship the best oceanographic vessel afloat and to provide facilities for as broad and complete a program as possible. Suggestions which will help us to achieve this aim will be most welcome.

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Edited by: **B. N. Nikitin**

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Marine Biology is one of six Russian monographs translated and published by the AIBS with support from the National Science Foundation.

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An answer to Philip Wylie's article about the scientific literacy of biologists and laymen

John A. Behnke

The Ronald Press Company, New York

Scientific Literacy

PHILIP WYLIE'S image of the idyllic layman in science and of the benighted, ingrown biologist (AIBS BULLETIN, June 1959) makes one wonder how large a sample of either he has known. Thirty years as a layman in constant contact with biologists, four years of the period with a direct concern for the layman's concept of science, lead this writer to a less stereotyped picture and one generally contradictory to Mr. Wylie's. The faults and problems of the biologist will first command our attention, and then we will turn the spotlight on the layman.

If we can infer who Mr. Wylie had in mind as "biologists" (never defined) we must encompass an exceedingly broad spectrum of disciplines from medical practice to palynology. We must remember that in any field of such breadth and such numbers (200,000 plus or minus) we may expect to find almost every kind of person capable of passing certain courses and satisfying certain requirements in a variety of colleges. There will be not only the energetic and lazy, the honest and the dishonest, the liberal and the conservative, but there will also be men broad in their interests and men dedicated, with a consuming purpose, to a single specialized problem, men of large ideas and men prowomen, too, of course. How different would the comviding small pieces of experimental evidence—and posite picture be if we were to look at lawyers, historians, or even authors? We need more men of depth, breadth and understanding in all walks of life.

Having said so much, we can agree that some scientists do need more understanding of both related and unrelated science and non-science. Medical doctors are often serious offenders in smug self-sufficiency. There are botanists who don't like zoologists and zoologists who don't care for psychologists, but this would hardly pass as organized hostility. Some *are* closed-minded, but the virologists are surely one of the least deserving of such censure. Their field is so new and knowledge so limited that they cannot afford to ignore clues from genetics, biochemistry or a myriad of other disciplines.

Terminology

If we may digress a moment to cover the question of scientific terminology, we infer from Mr. Wylie's account that scientific terms were invented merely to confuse and impress the layman. It should not be necessary to explain that science is international and that its terminology is essential for the very kind of intercommunication the lack of which our critic deplores. At the same time, most scientists will admit that, in some disciplines, scientists have tended to confuse each other by too much—sometimes unnecessary terminology. In the long run, however, may we not assume that useful terms will survive while the others disappear in the oblivion of disuse? At least, the scientists have achieved a working universal language of sorts.

Returning to the biologist and his myopic vision, certain facts seem to have escaped the critic from Miami. First, we have developed a promotional system in our institutions based on quantity of published material, preferably in the form of research papers. Too often the promotion of an individual is based on how long a string of publications he has garnered. The biologists may have contributed to the development of this dubious standard, but the blame must be shared not only by the other sciences, but the social sciences, humanities, and institutional administrations.

Secondly, as a result of this mania for quantity, even more than from the phenomenal expansion of research and development, there are now considerably more than 25,000 life science journals in the world, and librarians of science say that the number has been growing at the staggering rate of some 1,500 per year. The Royal Society conference in 1948 and the International Conference on Scientific Information in Washington in 1958 reported rather frantic gropings of scientific "consumers" and communication engineers to develop some system for facilitating the digestion and assimilation of the mountain of knowledge rising awesomely from the scientific laboratories. Thus far no one has proposed a workable solution, and we wonder if anyone can.

Thirdly, the biologist is not a "reading scholar" in the sense the historian or literary man is. The long hours the last two groups are spending in the library are being fully occupied by the biologist in the laboratory. To publish, and thereby to advance, he must have research results to write about. His reading—and he does a great deal of it—must, in the last instance, be directed toward the mass of research publications in his own immediate specialty.

If Mr. Wylie were face to face with this set of circumstances, just how broad a biologist would he become? And how would he decide what kind of breadth to acquire?

The Rare Layman

Mr. Wylie may have confused others, as he did me, about the layman and science. He opened by stating (parenthetically, it is true) that the "reasonably intelligent and fairly well informed" layman who knows a great deal about biology is indeed rare, but the subsequent discussion certainly left the reader with the impression that such laymen are far from rare and that they have a quite phenomenal knowledge, not only of biology, but of science in general. I for one would like to befriend the layman who, far surpassing his scientific contemporaries, has "some notion of the main present drift of knowledge in" some forty or fifty (the number is so high that exactness would be quite ridiculous) disciplines from virology to radiation propagation and encompassing such major fields as microbiology, biochemistry, anthropology, botany, zoology, medicine, physics, mathematics, chemistry and psychology. Let us hope that these paragons will soon become Congressmen so that the support of science will be determined by men with even broader scientific backgrounds than those seeking the funds for the advancement of science.

The recent study of the layman's scientific interests and reading, conducted under the direction of Hillyer Kriegbaum of New York University, would indicate not only a great deal of curiosity about science but a paucity of material readily available to satisfy this curiosity. The layman's reading in science, with some exceptions of course, would seem to be chance reading and would hardly lead to very profound knowledge, let alone the comprehensive sweep of familiarity described by Mr. Wylie. The idea of laymen reading extensively in such journals as "Science," unless we assume that they do this in libraries, can be easily refuted by a check of the membership rolls of the American Association for the Advancement of Science. Although we think of the "Scientific American" as a "popular magazine," well over 50% of its individual subscribers are scientists. Considering the potential numbers of subscriptions possible among scientists and laymen, the proportion and the actual number of laymen involved does not present a glowing picture of a general public avidly seeking to learn more about science. On the other hand, the large number of scientists subscribing testifies to their desire to learn about a broad range of developments in science as a whole. We might add that the layman who reads beyond the SM level and into the specialized journals would certainly be rare.

How many laymen there are who are anxious to make a solid intellectual contribution to science is unknown—to me at least. I can point to notable examples of those who have contributed and who have been welcome. Rutherford Platt, an advertising executive, has made a substantial contribution to our knowledge of plants. C. Lloyd Claff, after becoming curious about what went on at the Marine Biological Laboratory at Woods Hole, Massachusetts, went on to make original and valuable contributions to biology, biochemistry and the war effort and is still continuing his works at Woods Hole and at the medical schools in the Boston area while running a business "on the side." The layman with something worthwhile to offer will usually get a hearing and a chance.

Lastly, Mr. Wylie and I are in agreement that the layman is not being adequately informed about biology —or any other science for that matter. For this, the scientists must take a large share of the blame, and we must face the fact that, in spite of the great emphasis on science today, no constructive program has been initiated to correct it. The need for someone to make a serious effort in this direction is acute. However, the scientists I know do *not* feel that the public is well informed on all the sciences but their own, and there is a genuine feeling of interest in and alarm about the situation. Our education of non-scientists about science must be increased not only in quantity but in effectiveness if we are to prepare the citizen both in interest and knowledge to assimilate and understand more. Then, more must be provided in order to make the layman into a literate citizen in contemporary science.

THE AIBS BULLETIN *is anxious to publish articles in all fields of interest to biologists—especially illustrated articles. Average length is about 2500 words. If you have ideas you would like to communicate or expound, please send them to The Editor,* AIBS BULLETIN, *2000 P Street, N.W., Washington 6, D. C.*

Under National Defense Act, Title III, specialists are employed for short periods to improve teaching techniques

Frank B. Lindsay

Chief, Bureau of Secondary Education, State Department of Education, Sacramento, California

Improvement of Instruction in California High Schools

PUBLIC LAW 85-864, commonly known as the National Defense Education Act of 1958, in Title III provides financial assistance for strengthening science, mathematics, and modern foreign language instruction to the elementary and secondary schools of the states. In section 303 (a) (5) each state is required to include in its state plan, submitted to and approved by the Commissioner of Education in the United States Department of Health, Education, and Welfare:

> ". . . a program under which funds paid to the state from its allotment under section 302 (b) will be expended solely for (A) expansion or improvement of supervisory or related services in public elementary and secondary schools in the fields of science, mathematics, and modern foreign languages, and (B) administration of the State plan."

Legal interpretations of the Act have determined that persons employed under Title III, section 303 (a) (5), to carry out its provisions must be employees of the State Department of Education.

Using the Law

The California State Department of Education then had the choice either of adding consultants in the fields of science, mathematics, and foreign languages to the staffs of its Bureaus of Elementary and Secondary Education as full-time employees, or to retain specialists from time to time to perform particular services. In the opinion of the Bureau of Secondary Education more expert authorities in the fields covered by the Act might be secured from colleges and universities to assist the public schools for limited periods than could be attracted for full-time service as Department employees. This statement briefly reports the actions taken by the Bureau during the calendar year of 1959.

Before reviewing the series of meetings and committee work in science, mathematics, and foreign languages, brief notice may be taken of the procedure followed by the Bureau of Secondary Education in approving projects submitted by school districts for laboratory equipment. After the applications have been checked by the Bureau of National Defense Education Act Administration to determine that they have been submitted in proper form and that lists of proposed equipment contain only allowable items of apparatus, audio-visual materials and books other than textbooks, there follow four readings and evaluations. The Bureau of Secondary Education brings in competent teachers in the three fields who first assess each project from the standpoint of a classroom instructor. Then a panel of curriculum directors and supervisors of instruction on the staffs of counties and districts are obtained on loan for two weeks and every project is read and rated by two of these.

Next, a consultant in the Bureau of Secondary Education reads his share of the project applications. In this manner the judgments of capable teachers, supervisors from rural and urban areas, and staff members in the Division of Instruction are finally presented to the Chief of the Bureau who may then approve an application on the basis of these combined evaluations or refer it again to the NDEAA Bureau for revision or amendment as the applying district may elect. In a few instances a district has withdrawn its project when presented with the analyses of the evaluation team. Emphasis is given to the improvement of instruction which the district expects to achieve by means of newly acquired equipment, to the demonstrated competence of the teachers who will use it, and to the district's plan for checking the results in student learning.

Teaching the Teachers

The problem of assisting teachers to learn what subject matter and methods of teaching are recommended by national authorities in the fields of science, mathematics, and foreign languages is twofold. There

is a need to identify the content considered by recognized leaders to be of most worth for the citizen and the specialist who must live and work in today's world. There is a parallel need to acquaint administrators and curriculum directors with recent developments so that provisions can be made in program schedules for teachers to utilize new techniques and to acquire the necessary materials for effective instruction. To achieve these objectives the Bureau of Secondary Education has sought to use the limited funds at its disposal by employing for committee meetings and workshops the most competent scientists, mathematicians, and experts in audio-lingual language learning it can bring together.

In addition to utilizing NDEA funds for this purpose, the Bureau has had generous assistance extended by the professional associations which have frequently sent representatives to meetings at their own expense. For example, in late March, 1959, the Bureau invited selected county and district superintendents and their curriculum directors to participate in a symposium on new directions in science education. The American Institute of Biological Sciences was represented by its Executive Director, Hiden T. Cox, who outlined the modern concepts which have been determined by more than 150 biological scientists in cooperation with more than 200 classroom teachers as most appropriate for a tenth grade high school course in biology. To assist teachers, the Institute is producing a Secondary School Biological Sciences Film Series through which the most recent discoveries in ecology, genetics, and microbiology can be brought into the classroom to supplement a teacher's acquaintance with the more familiar content of the course.

In like manner the American Institute of Physics was represented by Professor J. W. Buchta of the University of Minnesota who explained the objectives the Institute seeks to achieve in improving high school courses in physics. Among these should be mentioned recommendations that the physics course stress major concepts and principles and extricate itself from routine and stereotyped laboratory exercises as well as the study in turn of one application after another until the subject becomes more a tinkering with radios, internal combustion engines, and rockets than a presentation of fundamental and unifying patterns and principles. More recently the American Institute of Physics contributed the services of Dr. W. C. Kelly, Education Director, to appear on the program of the annual meeting of the California School Boards Association to talk about the handbook for self-study groups, "How to Improve High School Courses in Physics." The Institute will distribute this publication early in 1960.

Language Instruction Workshop

In late June, 1959, the Bureau of Secondary Education organized its first extensive workshop whose resource leaders were secured through funds available under National Defense Education Act, Title III, section 303 (a) (5) funds for "expansion or improvement of supervisory or related services in public . . . secondary schools." It was devoted to modern methods and techniques in foreign language instruction for two reasons. In the first place, there is substantial agreement among foreign language experts and professors of linguistics as to the procedures and mastery realizable through the "aural-oral approach" or audio-lingual learning. Then a great many school districts were proposing to spend large sums to install language learning laboratories with intricate and elaborate equipment. It was a concern of the Bureau that school administrators should understand some of the problems connected with laboratory operation in order to purchase equipment wisely and to insure its effective use.

Every school district in California which had applied for funds to equip a language laboratory was invited to be represented and more than a hundred superintendents, supervisors, and teachers participated. A partial list of the principal speakers assembled by employment under NDEA Title III, section 303 (a) (5) as defined in the California state plan, with their topics, will illustrate the quality of the leadership:

> *Charles F. Hockett,* Professor of Linguistics, Cornell University: "Objectives and Processes of Language Instruction" and "Relationships between Development of Language Skills and Cultural Attitudes."
>
> *Elton Hocking,* Head, Department of Modern Languages, Purdue University: "Readiness Factors in Language Learning" and "The Language Laboratory in Language Learning."
>
> *Mary R. Hass,* Chairman, Department of Linguistics, University of California, Berkeley: "Differences Among Languages and Problems of Language Learning."
>
> *A. T. MacAllister,* Acting Director, Foreign Language Program, The Modern Language Association of America: "The Role of Foreign Language Organizations in the In-Service Education of Teachers."

In addition, Marjorie C. Johnson, Specialist for Foreign Languages, U. S. Office of Education, gave an overview of foreign language teaching in American high schools; Karl E. Schevill, Supervisor of Teaching of Foreign Languages, University of California at Berkeley, described means for evaluation of language learning; and Gustave Mathieu, Director, Margaret Husson Memorial Language Laboratory, Pomona College, demonstrated student practices in language learning. It is evident that the Bureau of Secondary Education could have brought together such an array of capabilities in no other way than by the use of NDEA funds for the employment of these persons for the period of the workshop. The proceedings which are now appearing in successive issues of the Department publication, *California Schools,* and will shortly be available in a combined reprint, provide a useful compendium for teachers and administrators who have responsibility for operation of a language laboratory.

There has occurred a very encouraging follow-through from the workshop on foreign language instruction on the part of school districts. Los Angeles City and Ventura County reported in detail to their teachers during the autumn months, and four regional workshops are scheduled for the period January to May about California. Administrators and teachers

who attended the statewide meeting have formed local committees and are drawing upon nearby higher institutions for expert leadership. These specialists in foreign language teaching become employees of the State Department of Education for the regional workshops at which they appear; local committees have completely free choice in selecting whom they wish to call upon, except that the college personnel must have demonstrated capabilities in order to be retained on the basis of NDEA funds for state supervision. The workshops which are already calendared are to be held at Delano, for teachers in Kern, Kings, and Tulare counties; at Riverside for that area; in the Alameda-Contra Costa part of the Bay Area; and at Sacramento for adjoining territory.

The pattern adopted by local planning groups has been a Friday afternoon and evening session for curriculum directors and administrators at which problems of installation and operation of language laboratories are discussed, and a Saturday program especially planned for teachers to whom techniques of audiolingual instruction are demonstrated by competent colleagues and who also discuss with the college leaders various aspects of "aural-oral" teaching. By judicious expenditure of the limited NDEA funds the Bureau has begun to reach a wide audience of teachers and administrators to bring them the best advice of competent authorities in the field.

Recommendations for Mathematics

The Bureau of Secondary Education has followed a very different approach in obtaining recommendations for high school courses in mathematics. For some time university centers across the nation have been engaged in studying revised content for pre-calculus mathematics and in the preparation of illustrative materials with which teachers may experiment. Since the General College was instituted at the University of Chicago, the Department of Mathematics has been concerned with the development of a modern basic course in mathematics for general education. At Yale a School Mathematics Study Group and at the University of Illinois a Committee on School Mathematics have similarly been active in recent years. At the University of Maryland a junior high school mathematics project has likewise been in operation. The Commission on Mathematics created by the College Entrance Examination Board also issued an elaborate report in 1959.

The pronouncements of these groups have been given attentive examination by many teachers and faculty committees in California high schools. In numerous districts experimentation has begun in the use of the materials produced at one center or another. There has occurred, however, some confusion in the minds of teachers and supervisors about which set of recommendations it would be preferable to adopt as a guide. It was the belief of the Bureau that there exists considerable consensus among the groups and that a reconciliation of viewpoints could be achieved.

Accordingly, through NDEA means outstanding representatives of the several centers were invited to meet for three days to present their convictions and to establish, if possible, the areas of agreement. Each was asked to examine in advance of the meeting the report of the CEEB Commission on Mathematics, the "Program for College Preparatory Mathematics," and to come prepared to state (1) with which items he found himself substantially in agreement, (2) with which he disagreed, and (3) upon what basis he differed. This procedure insured a focus for discussions and frame of reference in connection with which the recommendations of the several centers might be placed.

The generous and interested response to the Bureau's invitation is clearly shown by the roster of mathematicians who participated:

> William H. Meyer, University of Chicago, who also served as moderator for the sessions;
>
> E. G. Begle, Executive Director, School Mathematics Study Group;
>
> Howard F. Fehr, Teachers College, Columbia University, a member of the CEEB Commission on Mathematics;
>
> Karl Menger, Illinois Institute of Technology; and Raymond L. Wilder, University of Michigan, formerly president of the American Mathematical Society.

The University of Illinois Committee on School Mathematics was represented at Max Beberman's suggestion by H. Stewart Moredock, Sacramento State College. Other California higher institutions were represented by Harold M. Bacon, Stanford University; Paul H. Daus, University of California at Los Angeles; John L. Kelley, Chairman, Department of Mathematics, University of California at Berkeley; and Paul J. Kelly, Chairman, Department of Mathematics, David Merriell, and Lewis F. Walton, University of California at Santa Barbara, the host institution for the meeting. This brief review of Bureau activities in 1959 to improve instruction in science, mathematics and foreign languages does not permit detailing the sequence of content in high school mathematics which received endorsement by the group. The editing of the proceedings is going forward and will be distributed to school districts in spring, 1960. The Bureau is most appreciative of the spirit of cooperation manifested by the participants and confidently expects beneficial effects will follow from the widespread consideration it trusts may result.

Advice from Biologists

In like manner the Bureau brought together biological scientists from several higher institutions in California to advise its members about the Secondary School Biological Sciences Film Series now in production under the auspices of the American Institute of Biological Sciences. According to Hiden T. Cox, Executive Director, AIBS, who explained the objectives and content of the film series to the California delegation, more than one hundred scientists, each eminent in his chosen field, have determined the concepts and phenomena to be included in the series. An even larger number of classroom teachers are also cooperating to insure that every film may be of most help to supplement the instructor of a tenth grade course. Since AIBS has arranged that films may be purchased in any

quantity as desired, it will make it possible for districts with limited matching funds to submit applications for NDEA grants and thus acquire year by year the particular topics most needed to round out the course. By employing the films teachers can present to their students the most diverse habitats—ocean, desert, and mountain heights—so that they may observe at firsthand the adaptations living organisms have made to survive in each environment. The entire series is characterized by its built-in flexibility for use by the biology major or the average teacher who may have small familiarity with recent advances in the field.

Employment of NDEA Title III, section 303 (a) (5) funds to assemble informal committees of scientists and mathematicians to advise the Bureau and district personnel about appropriate reforms in high school instruction has another beneficial result. Such meetings acquaint the university experts with the purposes of American public education and the problems of teaching a pupil population with wide range of abilities in learning. The Bureau acknowledges in this regard the particular contribution of Zoologist Dixy L. Ray, University of Washington, whose familiarity with conditions in the biology classrooms of a neighboring state enabled her to portray vividly to her colleagues the limitations as well as the possibilities of improving teaching with the aid of films.

The small committee—Layman Benson, Pomona College; Samuel L. Meyer, College of the Pacific; Elmer R. Noble, University of California at Santa Barbara; Ray Owen, California Institute of Technology; and Victor C. Twitty, Stanford University—at the conclusion of its two days of deliberations assured the Bureau of its support for the AIBS film series and the Bureau's efforts to upgrade high school biology. A letter from George W. Beadle, Chairman, Division of Biology, California Institute of Technology, illustrates the genuine interest manifested. After mentioning the favorable report of the committee meeting given him by Ray Owen, Beadle continues:

> "If there is anything we at Caltech can do to help the good work along, please do not hesitate to let us know. For example, if we can help interest our school board in the possibility of a summer workshop to introduce the new AIBS films, we'll be glad to see what we can do."

Conclusion

The Bureau of Secondary Education expects to stimulate regional workshops for biology, physics, and mathematics parallel to the ones already organized for foreign language instruction. It is its considered judgment, on the basis of results so far achieved, that NDEA funds for improvement of supervision can effect the widest influence upon teachers and administrators by employment of recognized authorities in the several fields so that their experience and advice can be utilized through cooperative endeavors.

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This work is the most comprehensive study to date on the ixodid ticks of the USSR published in the Russian language. It was started by B. I. Pomerantzev but due to his untimely death was completed by his wife, G. V. Serdukova.

The author has divided his book roughly into two sections, the first dealing with the subject in an introductory theoretical manner; the second, and major portion of the work, dealing primarily with the classification and identification of the various forms.

The posthumous publication of this fundamental investigation of B. I. Pomerantzev is the final product of a basic change of opinion concerning the evolution and systematics of the ticks of the family Ixodidae. In this lies the theoretical and practical importance of this book.

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With the increasing necessity for the use of insecticides, our attitudes toward them must become more realistic

George C. Decker

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Insecticides in the 20th Century Environment[1]

WHEN THE FIRST white men came to North America, they found a race of rather primitive men living in reasonable harmony with a relatively stable environment. Under those conditions, this continent supported a population of about one million persons and provided in excess of 2000 acres per capita. Then, as now, literally dozens of insects attacked every crop that grew and neither man nor beast escaped their ravages. In the years that followed, with agriculture on a subsistence basis and a seemingly endless supply of land available, there was plenty for all, and farmers raised only feeble objections to share cropping with the insects. Later, as urban populations increased, each farmer was called upon to meet the food and fiber requirements of an ever-increasing number of individuals and to do so on an ever-decreasing number of acres per capita. This trend continued until at present we have only a little over ten acres per person, seven of which are classified as farm land but only two of which are devoted to crop production.

The early American farmers had little choice but to rely upon nature to control their insect enemies. Then, as losses mounted and the standards of perfection demanded by an increasingly more discriminating consuming public rose, farmers began to clamor for governmental aid and scientific guidance to solve their insect control problems. The early state and federal entomologists were essentially naturalists, and they preached a gospel of biological and cultural insect control methods. For years such measures dominated all entomological endeavor, but finally when natural controls proved wholly inadequate, entomologists reluctantly turned to chemicals, and thus we entered an age of chemical insect control.

The Advent of Insecticides

The large-scale practical use of insecticides is in reality one of the important technological developments of the 20th century. While it is true that numerous nondescript concoctions of lye, lime, soap, turpentine, brine, vinegar, fish oil, and even some tobacco, pyrethrum powder, mineral oil, and arsenic were reportedly used as insecticides prior to the year 1800, effective use of agricultural insecticides had its origin with the use of Paris green to control the Colorado potato beetle in 1867. For the next seventy-five years, arsenical compounds played an ever-increasing role in insect control. Thus, considering the many insecticidal uses for white arsenic, sodium arsenite, lead arsenate, calcium arsenate, and other arsenical salts, it is not surprising to find that from 1939 to 1948 the domestic consumption of white arsenic averaged over 35,000 tons per year. It must be noted also that the arsenicals were not the only chemicals used as insecticides in the pre-DDT era. To obtain a fair estimate of the extent of insecticide usage in the early 1940's, we would have to add about 15 million pounds of cryolite and related fluorine compounds, some 15 million pounds of pyrethrum flowers, 8-10 million pounds of rotenone-bearing roots and powders, and at least one million pounds of nicotine. Then to all of this we must add literally millions of gallons of petroleum oils, unestimated quantities of tars, cresols, fish oil, and many lesser products.

With the advent of DDT for agricultural use in 1945 and the large array of chlorinated hydrocarbon and organophosphate insecticides that followed in quick succession, many of the older materials suffered a rapid decline in popularity and they were largely replaced by the more effective synthetic organic insecticides. It appears that the actual tonnage of primary insecticidal chemicals produced for domestic consumption each year may not have changed materially. However, with the use of newer and more effective materials at much lower rates of application, the acreage treated has increased several fold in the last decade. Moreover, prior to the advent of DDT the use of insecticides was for the most part confined to fruit, vegetable, cotton, and a

[1]Condensed from a paper presented at a Symposium sponsored by the Ecological Society of America, "Ecological Problems of Pest Insects," given at the AIBS-sponsored meetings in Bloomington, Indiana, August, 1958.

few miscellaneous crops of high-per-acre value, they are now used quite extensively on several field crops, pastures, meadows, and forests.

When DDT and at least a dozen other new chemicals became available for general use, a number of competent and distinguished scientists expressed concern that widespread use of these materials might create a public health problem. Immediately a number of publicity seekers and misguided individuals seized upon the idea that the public was being poisoned, and the country was deluged with an amazing flood of scare stories. Then, as the general public began to show some concern, the witch hunt got underway in earnest. As absurd charges and counter-charges were hurled back and forth in congressional committees and in the press, the scientists settled down to a detailed analysis and factual study of the problem. The public health aspects were reviewed by several scientific bodies, notably the World Health Organization (1, 12), the U. S. Public Health Service (7), and the Food Protection Committee of the National Research Council (4, 6). The general conclusions drawn in each instance were: (a) The large-scale usage of pesticides in the manner recommended by manufacturers or competent authorities and consistent with the rules and regulations promulgated under existing laws would not be inconsistent with sound public health programs, and (b) although the careless or unauthorized use of pesticidal chemicals might pose potential hazards requiring further consideration and study, there was no cause for alarm.

These encouraging conclusions notwithstanding, the fact that insecticides may be misused remains a matter of concern to a considerable segment of the American public. This is true particularly of conservationists who quite correctly insist that many forms of wildlife are subjected to certain potential hazards not shared by man and his domestic animals.

Clarification of Terms

As a prelude to any attempted evaluation of the hazards which may be inherent in the use of insecticides, a few frequently unused terms must be clearly defined. To avoid endless confusion, a careful distinction must be drawn between the terms hazard and toxicity. As the Food Protection Committee of the National Research Council has repeatedly pointed out: "Toxicity is the capacity of a substance to produce injury; hazard is the probability that injury will result from the use of the substance in the quantity and in the manner proposed." Therefore, to be at all reliable, an estimate of the hazard involved in the use of any substance must be based upon a knowledge of its inherent toxicity and upon the details of its proposed use.

It is also imperative to recognize and understand the equally clear-cut difference between the terms acute and chronic toxicity. In general, *acute toxicity* refers to toxic effects (either lethal or profound) occurring immediately after, or at least definitely attributable to, a single exposure by any route of administration, but usually referring to ingestion. *Chronic toxicity* refers to toxic effects resulting from repeated or multiple exposures extending over a period of time and is generally considered to be accumulative in nature.

Elm trees killed by Dutch elm disease. Tree lovers insist this should not have been permitted; bird lovers insist trees should not be sprayed if birds and other wildlife may be adversely affected.

As noted earlier, the hazards to man and his domestic animals resulting from approved uses for insecticides in public health and agricultural insect control programs have been extensively studied and the general sum and substance of all research in this field has failed to indicate any significant public health hazards. It is generally conceded that safety factors ranging from 10 to 100 fold have been included in most recommendations and at times such factors have been superimposed one upon another until the possibility that an actual hazard may exist is fantastically remote. Whereas man and his domestic animals are afforded much protection by the labeling requirements of the Insecticide, Fungicide, and Rodenticide Act of 1947, which specifies definite time-lapse intervals between insecticide applications and the harvest or consumption of the crop, it is generally recognized that most forms of wildlife can hardly be expected to avail themselves of such precautions. It is also recognized that fish, reptiles, amphibians, and numerous arthropods are more susceptible to insecticide poisoning than are mammals and birds, and in fact there have been a number of cases where fish were killed following the direct or inadvertent contamination of streams and lakes.

As a matter of fact, entomologists, toxicologists, and wildlife biologists alike recognize that some species of wildlife are subjected to hazards not encountered by man or by his domestic animals and thus they present special problems requiring special research attention. For example, it is well known that in general the food consumption of animals is more or less inversely proportionate to their size; thus birds, rabbits, and other forms of wildlife receiving the same diet as much larger animals actually ingest larger amounts of pesticidal chemicals in terms of mg/kg of body weight.

Then too, in many treated areas the intake of insecticides by various forms of wildlife may be by ingestion, inhalation, or absorption, and under some conditions certain species may be subjected simultaneously to exposure by all three routes of administration. Finally, it is obvious that relatively small species moving in, around, and under a vegetative cover are subjected to greater and more prolonged exposure than are larger domestic animals standing well above the contaminated vegetation.

In view of the foregoing factors, it is not surprising that there have been numerous instances where wildlife of varied types has been adversely affected by insecticides. At the same time, the preponderance of evidence to date indicate that such incidents can usually be traced to carelessness, to accidents, to instances of outright experimentation, or to non-agricultural programs involving anticipatable hazards. Considering the thousands of tons of insecticides that have been used —and misused—in the control of agricultural pests during the last 50 years, it can be concluded that to date the impact of insecticide usage on wildlife has neither been great nor disastrous. This holds true for orchards, market gardens and cotton fields, which represent the most extensive and intensive agricultural usage of insecticides. Actually, considered from the broad point of view, the impact of agricultural and public health insecticide use on wildlife has been insignificant when compared with many of the other everyday activities of man.

In contrast to these remarkably safe agricultural practices, the existence of some very specialized insect control programs that call for per-acre insecticide dosage rates as much as 5 to 10 times those required in most agricultural uses must be recognized. These do involve calculated risks insofar as wildlife is concerned. The spraying of elms for the control of phloem necrosis or the Dutch elm disease, and the fire ant control program are examples. In such cases the interested parties must, or at least should, with the aid of competent experts, weigh the facts pro and con and then adopt a course of action that will best serve overall interests.

The Balance of Nature

Not infrequently insecticides are accused of upsetting the balance of nature, when in many instances it would be more accurate to say they were used to suppress an organism already out of balance. Actually, man himself has been the primary factor in upsetting the so-called natural balance. When he cleared the forest, plowed the prairies, drained a marsh, or dammed a stream, he altered an entire environmental complex and set up an entirely new set of opposing forces which if left uninhibited would establish an entirely new biotic equilibrium. Presumably it is obvious to all that nature's balance is not a static condition, but is rather a fluid condition changing from day to day, and at the same time constantly moving forward in response to the forces of changing geologic time and advancing culture. Insecticides represent only one minor element of these dynamic forces.

In nature, every living organism is engaged in the most ruthless kind of competition with every other organism upon which its interests impinge. Man is a part of that environment. That he has been eminently successful is evidenced by the fact that the human population of this country has risen from less than one million to over 170 million in some fifteen to twenty generations. It now becomes apparent that to clothe and feed this vastly increased population, man must maintain his position of dominance, and our agricultural production must continue to increase even at the expense of the further displacement of native plants and animals. It may be news to some that these pressures are now intensified by the fact we have at last absorbed and brought into production most of the lands suitable for agricultural production. As a matter of fact, 1954 marked a turning point in our history because then for the first time the withdrawal of agricultural land for use as home or industrial sites, airports, and highways exceeded the land reclaimed, and the number of acres in farms showed a decline. While America is presently blessed or, as some say, plagued, by overproduction, with populations increasing and the area of farm land tending downward, it will be a matter of only a few years until agricultural scientists and farmers will have to make ever-increasing use of new advances in agricultural technology, including even greater use of insecticides and other pesticides, to meet the nation's food and fiber requirements.

Population and Land Use

In a recent discussion of population dynamics and land use problems, H. B. Mills (9) said: "When we think of the future of recreational lands in all of this competition for land use, we cannot get away from zoning. We must think of areas where people will live, where they will work, where their roads will go, where they will produce their food, where they can find outdoor relaxation, and where wildlife can live and prosper. We may not like the idea of such regimentation; it will be an expression of restriction of personal freedom due to increased population density."

In 1954, the United States Department of Agriculture (11) estimated that to offset the pest losses in agricultural production, an extra 88 million acres must be cultivated, and that losses subsequent to harvest equal the production of an additional 32 million acres. Is it not possible that the benefits to be derived by diverting these acres to soil and wildlife conservation would far exceed any foreseeable damage that might accrue from the approved use of insecticides? The recent amendment of the duck stamp law is a step in the right direction, but this is apparently not enough. There is still some talk of a land bank, and the disposition of submarginal lands is still an open question. But 10 years hence may be too late. Is it possible that while dissipating our energies pondering potential hazards that may never materialize, we are missing the opportunity of a lifetime to secure and preserve an adequate representation of our native fauna and flora to be forever maintained in suitable conservation and recreational areas?

Difficulties of Evaluation

Those familiar with the excellent reviews on wildlife-insecticide relationships by Brown (2), Rudd and Genelly (10), and Cope and Springer (3) must be aware of the fact there is a considerable volume of excellent field and laboratory research, much of which tends to pinpoint areas of considerable concern where further research is needed. Nevertheless, at times it is difficult to evaluate properly many of the criticisms directed against insecticides and certain insect control practices. For example, some authors frequently note that a certain insecticide such as aldrin or heptachlor, is 5, 10, or even 20 times as toxic as DDT and then, after commenting in a matter-of-fact way that it may persist for several years, they imply that the hazard involved is tremendous, when actually the hazard may be insignificant because the dosage is low and the residue is rapidly lost. All too often the results of some laboratory or field experiments are cited as if they were typical of conditions to be encountered following the legitimate use of the insecticide in the field. Then, too, one frequently encounters vague references to mass applications of insecticides without any further detail. Some attempt should be made to distinguish between the treatment of a million acres of cotton with X insecticide at 2 ounces per acre, and an equal area of marsh or timberland at 2 pounds per acre. A million acres is a lot of ground, but, after all, it represents considerably less than 1/10 of one per cent of the land area of the United States.

Pre-testing Insecticides

It is frequently asserted that new insecticides are introduced and released for large-scale insect control operations without adequate pre-testing, but apparently these critics are unaware that as early as 1948, Dr. A. J. Lehman (8) clearly and with amazing accuracy set forth the toxicological characteristics of DDT and related compounds. Then, too, the very fact that the review by Rudd and Genelly (10) contains a bibliography in excess of a thousand titles would indicate that the characteristics of insecticidal chemicals are not entirely unknown. As a matter of fact, there are experts who would testify that few if any chemicals known to man have undergone the toxicological scrutiny to which DDT has been subjected. It is true that all questions and problems have not been entirely resolved "beyond a shadow of a doubt," but that is not surprising, for after all, science is seldom if ever static and there are few instances where a scientist can claim he has established all of the answers finally, conclusively, and irrevocably.

Actually, there are many problems related to insecticidal chemicals that cannot be anticipated or resolved in advance in any laboratory or small plot experiments. As a matter of fact, in establishing the principles to be observed in the evaluation of new insecticides, the Food Protection Committee of the National Research Council (5) acknowledged this basic truth when it said: "Complete knowledge of many factors pertaining to pesticide usage, performance, and ultimate safety can be developed only through actual use in large scale performance tests. Hence, any system proposed for regulating the distribution of new materials should provide for their orderly release with recognized steps between strictly controlled small plot experiments and full scale commercial operations." This being the case, one must anticipate certain adverse reactions and responses in the early large-scale usage of a pesticide. The correct procedure is to make sure such instances are detected and corrected as soon as possible. While the occurrence of such incidents is disturbing and regrettable, it seems reasonably certain the adverse effects will rarely if ever be disastrous or permanent.

Not infrequently the wildlife specialist and the conservationist feel that they are placed at a disadvantage in presenting their case because in a large degree the values with which they deal are intangible and thus the reconciliation of divergent points of view which often elicit strong emotional responses becomes doubly difficult. Even here, there are at least some entomologists who can lend a sympathetic ear, for insect control also has its intangible considerations which can likewise induce violent emotional eruptions.

Many of the most dreaded diseases of man are insect-borne, and there are those who regard the continued control of insect disease vectors as essential to the maintenance of successful public health programs. The hundreds of phone calls that besiege public health officials when nuisance mosquitoes become annoying lend ample testimony to the public interest in and the demand for local mosquito control programs.

Then, too, a large segment of the American public is profoundly interested in the protection of shade trees, ornamental plantings, and forests. Literally thousands of individuals, recalling with profound regret the demise of the chestnut tree because no effective disease control measures were available, vociferously demand that every possible effort be made to assure that the same fate does not befall the American elm, the most common and perhaps the most beloved shade tree in America. In the battle for the elms we approach the tragedy of civil war, for here we have entomologist pitted against entomologist, conservationist against conservationist, and neighbor against neighbor. Last but not least, the fact that the Congress of the United States and a score of state legislatures, normally reluctant to appropriate funds, except in response to great pressure, have approved plans and appropriated funds for several large-scale insect control programs, testifies to the public interest in phases of insect control which do not affect its diet and only indirectly its pocketbook.

Considering All Sides

Any fair and impartial appraisal of the impact of insecticides on wildlife must give equal consideration to both the good and bad side effects that may occur, and if we are to be honest we must look for the good as diligently as we look for the bad. Unfortunately, harmful side-effects are usually readily apparent, whereas indirect beneficial results are apt to pass totally unobserved. Nevertheless, the impartial observer may be pardoned if he considers the loss of a few song birds attributable to the spraying of elm

trees less harmful than the permanent loss of such trees, with the accompanying disappearance of nest sites.

Unfortunately, the ultimate effect of insecticide usage on animal life cannot always be measured in terms of initial mortality of individual species. In reality it must reflect and encompass the long-term effects on both plant and animal life. Since the latter are largely dependent upon plants for both food and shelter, is it not possible that the destruction of timber, range vegetation, or cultivated crops by insects may produce a chain reaction that will ultimately affect all of the forms of life in the area?

Conclusions

There is no question but that the future food, fiber, and public health needs of this country will assure the continued, if not, indeed, the greatly expanded use of insecticides for generations to come.

Despite the widespread use of insecticides totaling billions of pounds in the last decade, profound fears that the large-scale usage of modern pesticidal chemicals would seriously upset the balance of nature and result in disastrous losses of wildlife have not been realized. To quote from the most comprehensive and complete study of the problem (10), "Considered in its broadest scope, at the present time pesticides seem to be only minor influents in nature compared to other factors in land and water development and use."

Favorable results notwithstanding, the many diverse and complex problems of wildlife conservation in a chemical world must be kept under continued surveillance. Particular attention should be devoted to the welfare of rare species of restricted habitat, to the impact of new chemicals as they are introduced, and to pest control programs involving the widespread application of insecticides over large contiguous areas.

Since most of the unfortunate incidents, problems, and differences of opinion that have arisen or are likely to arise, involve insecticide usage (unintentional or otherwise) that was not covered by label approval, it appears that the solution of the problem at hand rests in the detection, isolation, proper evaluation, and eventual elimination of malpractices rather than indulgence in wholesale condemnation of insecticides and insecticide usage *per se*.

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PAYMENT FOR ACCOMMODATIONS IN THE RESIDENCE HALLS IS MADE AT THE TIME OF CHECK-IN.

Because of limited accommodations, everyone planning to attend the conference is urged to make housing reservations well in advance. Acknowledgment will be made for pre-registration forms received before August 14. These acknowledgments should be presented upon arrival at the registration area in the Student Union Building on the University campus. Your residence hall and room number will be designated at final registration.

Reservation requests for housing should be made on the application on page 35 and mailed to:

Fred LeCrone
107 Whitehurst Hall
Oklahoma State University
Stillwater, Oklahoma

DO NOT SEND MONEY WITH PRE-REGISTRATION. Acknowledgment of each advance registration received before August 14 will be made on a form which should be presented upon arrival at the registration area in the Student Union Building on the University campus.

OTHER HOUSING—Limited camping facilities are available 18 miles west of Stillwater at Lake Carl Blackwell on Highway 51. For further information and reservation requests, please write directly to Dr. Fred LeCrone, Whitehurst 107, Oklahoma State University, Stillwater, Oklahoma.

FOOD SERVICE—Food service will be available in three dining areas which will provide a la carte cafeteria service utilizing a pay-as-served system.

Persons in residence in Bennett Hall should plan to have their meals in the Bennett Hall cafeteria.

Persons in residence in Willard and Murray Halls should plan to have their meals in the Willard Hall cafeteria.

Persons in residence in Stout Hall, Cordell Hall and in off campus housing should plan to have their meals in the Student Union cafeteria.

Delegates should allow approximately $2.50 per person per day for cafeteria meals.

The cafeterias will be open for breakfast from 6:15 a.m.—10:15 a.m., for lunch 11:15 a.m.—1:30 p.m., and dinner 4:45 p.m.—6:30 p.m. The snack bars in the Student Union and in Bennett Hall will supplement the meal service by opening at 8:00 a.m. and closing at 12 midnight each day.

BANQUETS—Special breakfasts, luncheons, and banquets are listed in the schedule on page 39. Tickets may be purchased at final registration.

PRE-REGISTRATION

AIBS–SPONSORED MEETINGS OF BIOLOGICAL SOCIETIES

OKLAHOMA STATE UNIVERSITY

August 28 - September 1

REGISTRATION AND HOUSING APPLICATION

Name..... (First) (Middle) (Surname)

Home Address..... (Street)

..... (City) (State)

Professional Address.....

.....

Title.....

Institution.....

Are you a Graduate Student?.....
(Graduate Students are eligible for a reduced registration fee)

Signature of major professor.....
(Applies only to Graduate Students)

Society Membership:
(1).....

(2).....

(3).....

I plan to attend the following society banquets.....

.....

I plan to take the following field trips.....

Please print or type the above information and mail to:

107 WHITEHURST HALL
OKLAHOMA STATE UNIVERSITY
STILLWATER, OKLAHOMA

Date.....

Male ☐ Female ☐

Roommate Preference..... (Name)

Couple ☐ Couple with children ☐

Child's name	Sex	Age
.....	.....	.....
.....	.....	.....
.....	.....	.....

Expected time of arrival at Stillwater, Oklahoma..... (Date, Hour)

Departure from Stillwater, Oklahoma..... (Date, Hour)

Please make reservations for me in a University Residence Hall ☐

I will not require housing ☐

Remarks:.....

.....

.....

TRAVEL ARRANGEMENTS

I expect to arrive by
train at Perry, Okla.
(via Sante Fe R.R.) ..... (Date, Hour)

plane at Tulsa..... (Date, Hour)

plane at Oklahoma City..... (Date, Hour)

plane at Stillwater..... (Central Airlines) (Date, Hour)

bus at Stillwater..... (MK & O Lines) (Date, Hour)

automobile ..... (Date, Hour)

NOTE: Commercial bus service will be available from train station and limousine service will be available from airports to Stillwater.

Russian Biological Journal Translations

The AIBS is currently translating and publishing seven Russian research journals in biology. These journals are translated with support from the National Science Foundation, which is eager that such information be more widely distributed to biologists throughout the world. It is hoped that this material will aid biologists in research, prevent duplication of work, give some idea of what is being done by Soviet scientists in the field of biology, and also bring about a better international understanding among scientists. Four of these Journals are described below.

SOVIET SOIL SCIENCE • POCHVOVEDENIYE

This is a translation of the Russian journal, POCHVOVEDENIYE, beginning with the January, 1958 issue, and edited by Dr. A. P. Mazurak of the University of Nebraska. It publishes research done at various institutes in the fields of soil chemistry, soil physics, soil microbiology, soil fertility, soil genesis and classification, soil conservation, irrigation, and related aspects of soil science. The journal is divided into sections on general articles, methods, discussions, book reviews, and chronicles.

12 issues per year. First issues published: 1958. Current issues published: Jan.-Dec. 1958.

Yearly Subscriptions: $40.00, individuals and industrial libraries (U.S.A. & Canada); $20.00, AIBS members and all other libraries; $3.00, additional to each price, foreign. **Single copies:** $4.50.

ENTOMOLOGICAL REVIEW • ENTOMOLOGICHESKOE OBOZRENIE

Very few Entomologists would not find something of special interest to them in any one issue of this periodical. It deals with theoretical and practical problems in the field of entomology and their significance for the national economy. It contains articles on all branches of entomology and devotes particular attention to problems connected with the theoretical basis of agriculture and public health service.

4 issues per year. First issues published: 1958; Current issues published: 1958, Vol. 37, Nos. 1–4.

Yearly Subscriptions: $25.00, individuals and industrial libraries (U.S.A. & Canada); $12.00, AIBS members and all other libraries; $3.00, additional to each price, foreign. **Single copies:** $7.50.

PLANT PHYSIOLOGY • FIZIOLOGIYA RASTENY

This journal publishes original studies of an experimental nature on various problems of the physiology of plants, reviews, critical articles and discussions on major problems in this field.

The journal is divided into four sections and a few titles listed under each section from one issue are: General articles—The Interrelationships of Foliar and Root Mineral Nutrition in Plants, by N. I. Shereverya; and The Transport Form of Carbohydrates in Pumpkin Plants, by N. A. Pristupa; Brief Communications—Iron and Manganese in Photosynthesis, by E. A. Borchenko.

6 issues per year. First issues published: 1957, Vol. 4, Nos. 1–6. Current issues published: 1959, Vol 6, Nos. 1–6.

Yearly Subscriptions: $15.00, individuals and industrial libraries (U.S.A. & Canada); $11.00, AIBS members and all other libraries; $2.00, additional to each price, foreign. **Single copies:** $3.00.

MICROBIOLOGY • MICROBIOLOGIYA

This journal deals with problems of general microbiology (systematics, morphology, physiology and variability of microorganisms), agricultural microbiology (microbiology of soils and fodder crops, bacterial fertilizers), technical microbiology, the microbiology of foods and the microbiology of water reservoirs.

This journal also contains sections on the History of Science, Book Reviews, and Current Events in the field of Microbiology, as well as the general articles in this field.

6 issues per year. First issues published: 1957, Vol. 26, Nos. 1–6. Current issues published: 1959, Vol. 28, Nos. 1–6.

Yearly Subscriptions: $20.00, individuals and industrial libraries (U.S.A. & Canada), $15.00, AIBS members and all other libraries; $2.50, additional to each price, foreign. **Single copies:** $4.00.

All orders should be addressed to:

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

2000 P St., N.W. Washington 6, D. C.

THE EDITOR'S DESK

The Microbiology Branch of the Office of Naval Research, Department of the Navy, is now accepting applications for review by the Advisory Panel during Fiscal Year 1961. For further information concerning the preparation of proposals contact: Microbiology Branch (Code 443), Department of the Navy, Office of Naval Research, Washington 25, D. C.

The Woods Hole Oceanographic Institution announces the availability of a small number of year-round fellowships to support both pre- and postdoctoral students carrying on research at the Institution. Interest in open ocean marine problems and previous experience in this area will be important considerations in the awards. For information and application procedures write: Chairman, The Fellowship Committee, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.

The Society for Industrial Microbiology was legally incorporated on February 10, 1960, with official filing in the District of Columbia of a Certificate of Incorporation signed by Walter N. Ezekiel, Samuel Shapiro, and Earnest A. Walker, and witnessed by Carl J. Wessel. Three of these are charter members of the Society, which was organized by Dr. Ezekiel a little more than ten years ago.

Novel areas of research, and application to new problems such as the prevention of microbiological damage to electrical and electronic portions of equipment, were becoming recognized as important to the military services and also to civilian consumers. Microbiologists, bacteriologists, chemists, engineers, administrators, manufacturers, and others concerned with these matters found discussions on them and on related topics dispersed through the sessions of older scientific organizations, which better covered their own avowed fields of application of microbiology to medicine or to agriculture. .

It was to fill this gap that the Society for Industrial Microbiology was conceived. Its particular purpose has been to serve as a meeting place for the special inter-science groups concerned with borderline areas between biology, chemistry, engineering, and several other professional disciplines as applied to industrial materials and processes. The Society has held ten annual meetings with the AIBS, from Columbus in 1950 to Pennsylvania State University in 1959, and six meetings with the AAAS. There are over 500 members.

Recent meetings have included sessions on topics such as Microbiology in Outer Space Research, Variations in Microorganisms, Self-Sanitizing Agents for Fabrics, Fungal Metabolism and Fungicides.

Officers of the Society for the current year are: President, Charles C. Yeager, Scientific Oil Compounding Co., Chicago; Vice-President, Alton E. Prince, 135 N. Walnut St., Yellow Springs, Ohio; Secretary, Brinton M. Miller, Merck Sharp & Dohme Research Laboratories, Rahway, N. J.; and Treasurer, Arthur W. Kaplan, Quartermaster Research and Development Command, Natick, Mass. Prospective new members may send their names and addresses (and dues of $3) to the Secretary or the Treasurer.

The American Association of University Women Educational Foundation has announced fellowships awarded for advanced research during 1960–61. The Althea Kratz Hottel Fellowship has been awarded to **Allegra Ann Genest** for research at Max-Planck Institute in Germany toward a doctorate from Yale University in zoology. **Elizabeth A. McMahan** was awarded the Gladys Murphy Graham Fellowship for research in entomology at the University of Hawaii.

Applications are being accepted for the position of the **Jacques Loeb Associate in marine biology for one year beginning on or about September 1, 1960,** at the Rockefeller Institute in New York and at the Marine Biological Laboratory, Woods Hole, Massachusetts. For more details, please write the Office of the President, The Rockefeller Institute, New York 21, New York.

Dr. Pietro O. Bramante, assistant professor of physiology at the St. Louis University School of Medicine has been awarded a new research grant by the United States Public Health Service for investigations of the energy exchanges and respiratory metabolic phenomena of albino rats and hamsters in relationship to their endocrine function. The grant totals $27,347 for a three-year period.

The 1960 edition of **Study Abroad, a UNESCO publication** issued each year, contains listings of about 90,000 opportunities. This book is a major source of information for students who wish to study in a foreign country. Information about the book may be obtained from Columbia University Press, 2960 Broadway, New York 27, New York.

Two **resident research fellowships in anthropology,** the first of their kind ever offered by the American Museum of Natural History, will be awarded annually. They will be known as the Ogden Mills Fellowships, and will enable graduate students to spend time doing research using the Museum's materials and facilities. Further information may be obtained from Dr. Harry L. Shapiro, Department of Anthropology, The American Museum of Natural History, New York 24, New York.

Nominations will be accepted until June 1 for the **Darbaker Prize of the Botanical Society of America.** The award is to be made for meritorious work in the study of the algae. Papers by residents of North America, in the English language, will be considered. Further information may be obtained from the Secretary of the Society, B. L. Turner, Department of Botany, The University of Texas, Austin 12.

Future Biological Meetings and Conferences

The **Tenth Pacific Science Congress of the Pacific Science Association** will be held at the University of Hawaii from August 21 to September 6, 1961. It is sponsored by the National Academy of Sciences and Bernice P. Bishop Museum, with the cooperation of the University of Hawaii. Scientific sessions will be held from August 21 to September 2, with a post-sessional field trip through September 6. Please address inquiries to: Secretary-General, Tenth Pacific Science Congress, Bishop Museum, Honolulu 17, Hawaii.

A symposium on **Microbial Reactions in Marine Environments** will be held April 20–24 in Chicago, Illinois. Information may be obtained from C. H. Oppenheimer Institute of Marine Science, Port Aransas, Texas.

The **Third International Conference on Medical Electronics** will be held in London July 21 to 27. The Conference is planned to bring together members of the medical and electrical engineering professions. For information, write to the Secretary, The Institution of Electrical Engineers, Savoy Place, London, W.C. 2, England.

The third **Conference on Biological Waste Treatment** will be held in New York April 20 to 22. Information may be obtained from W. W. Eckenfelder, Department of Civil Engineering, Manhattan College, New York 71, New York.

The **American Society of Ichthyologists and Herpetologists** will meet in Chicago, Illinois June 17 through 19. Roger Conant, Philadelphia Zoological Garden, 34th St. and Girard Ave., Philadelphia 4, Pennsylvania, the Secretary of the Society, can supply further information.

The 18th Annual Symposium of the Society for the Study of Development and Growth will be held at Brandeis University, Waltham, Massachusetts, June 20-22. The topic will be "Synthesis of Molecular and Cellular Structure in Development." Further information may be obtained from the Secretary of the Society, William P. Jacobs, Department of Biology, Princeton University, Princeton, New Jersey.

The **Fifth Annual Conference on Quantitative Animal Cell Culture *in vitro***, will be conducted by the Department of Biophysics of the University of Colorado during the period of June 19 to June 22, 1960. The course is sponsored by the Colorado Division of the American Cancer Society and is open to persons with the Doctorate Degree who are doing research or graduate teaching in Biology and Medicine and to students who are currently enrolled as candidates for the Ph. D. Degree in Biological Disciplines. Major emphasis will be placed on application of the quantitative methodologies to problems in mammalian cell genetics and chromosome analysis, biochemistry, virus-host cell interaction, and radiation studies. Application of these methods in clinical medicine will also be considered. Because requests for admission have, in the past, always exceeded the available facilities, applicants up to the limit of 45 will be accepted in order of receipt of their completed applications. Inquiries should be addressed to the Department of Postgraduate Medical Education, University of Colorado Medical Center, 4200 East Ninth Avenue, Denver 20, Colorado.

Laboratory directors will be meeting in San Francisco, June 1 to 4, to discuss new methods of bioanalysis and clinical laboratory techniques at the first annual joint convention of the **American Association of Bioanalysts** and the **California Association of Clinical Laboratories.**

The Canadian Society of Plant Physiologists will hold its first scientific meeting at the University of Toronto on June 2 and 3. The proceedings will include a symposium on developmental physiology. Inquiries should be addressed to the Secretary-Treasurer, Dr. D. F. Forward, Department of Botany, University of Toronto, Toronto, Canada.

The recently formed **Society for Economic Botany** will hold its first annual meeting at Purdue University, May 21 and 22. Highlight of the meeting will be a symposium on Integrated Research in Economic Plants. Information about the Society may be obtained from Dr. Quentin Jones, New Crops Research Branch, Beltsville, Maryland.

Plans are now being made for the **13th Annual Conference on Electrical Techniques in Medicine and Biology**, to be held in Washington, D. C., October 31 to November 2, 1960. The theme of the conference will be the application of electronic techniques to analytical instrumentation. Papers representing original contributions are invited. Abstracts should be submitted before July 1. For further information, write George N. Webb, Room 547—CSB, Johns Hopkins Hospital, Baltimore 5, Maryland.

Summer Activities

A short course in **Medical Genetics** (Heredity and Disease in Man and Animals) will be conducted at Bar Harbor August 8 to 20 by members of the faculty of the Johns Hopkins University School of Medicine and the staff of the Roscoe B. Jackson Memorial Laboratory. The course is designed primarily for persons in medical teaching and research. Further information can be obtained from the co-directors of the course: Dr. Victor A. McKusick, Johns Hopkins Hospital, Baltimore 5, Maryland, and Dr. John L. Fuller, Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine.

A special **Summer Laboratory Course in Techniques and Applications of the Electron Microscope**, sponsored by a grant from the National Science Foundation, will be offered to qualified senior biologists and medical research workers. The course will take place at Cornell University's Electron Microscopy Laboratory from June 13 through July 1. It will include extensive laboratory work and lectures by prominent guests. Requests for information should be addressed to the director of the course, Professor Benjamin M. Siegel, Rockefeller Hall, Cornell University, Ithaca, New York.

A Summer Institute in the Biology of the Desert will be offered from June 27 to August 6 at Arizona State University. The course is open to biology teachers with at least three years' experience in junior college, college or university teaching. Application forms may be obtained from Dr. Gordon L. Bender, Director, Summer Institute of Desert Biology, Division of Life Sciences, Arizona State University, Tempe, Arizona.

Two terms—June 16 through July 20 and July 21 through August 24—will be offered in the thirty-first season of the summer session at the **University of Virginia's Mountain Lake Biological Station.** Information may be obtained from the Director, Mountain Lake Biological Station, Biology Building, University of Virginia, Charlottesville, Virginia.

The University of Michigan Biological Station will offer a program centered on living organisms in their natural environment, emphasizing biological features peculiar to the Great Lakes region. The session will run from June 18 to August 13. Some National Science Foundation grants-in-aid are available, as well as limited funds from other sources. For information, write to the University of Michigan Biological Station, 2129 Natural Science Building, Ann Arbor, Michigan.

A course in **Military Entomology** will be presented by the Armed Forces Pest Control Board July 10 to 23 at the National Naval Medical Center in Bethesda, Maryland. Information about this training conference is available from the Armed Forces Pest Control Board, Forest Glen Section, Walter Reed Army Medical Center, Washington 12, D. C.

From July 5 to August 17 **Harvard Summer School** in cooperation with the Massachusetts Audubon Society will offer courses in field botany and field zoology. Information may be obtained from the Harvard Summer School, 2 Weld Hall, Cambridge 38, Massachusetts.

The Argonne National Laboratory announces a special summer course on **Methods in Radiation Biology** from June 20 to July 15. The course is intended primarily for persons with considerable experience in biological research who plan to undertake investigation of the special problems of radiation actions on living systems. For further information, write John F. Thomson, Director, Radiation Biology Course, Division of Biological and Medical Research, Argonne National Laboratory, Box 299, Lemont, Illinois.

Information about the Biological Societies Meeting in Oklahoma

AIBS Meetings 1960—Many biological societies meeting with the AIBS at the Oklahoma State University are planning breakfasts, luncheons, teas, or banquets. Those already scheduled appear below:

August 28
Dinner:
National Joint Committee on Fertilizer Application (Executive Committee) American Society for Horticultural Science (Executive Committee)

August 29
Luncheon:
Nature Conservancy
American Fern Society
Tea:
Wives of Horticultural Science members

August 30
Luncheon:
Genetics Society of America
Dinner:
American Society for Horticultural Science (Annual Banquet)
Society for Industrial Microbiology
American Society of Plant Taxonomists
Coffee:
Wives of Horticultural Science members

August 31
Buffet Luncheon:
American Society for Horticultural Science (Extension)

Transportation Information

Location: Oklahoma State University is located in Stillwater, Oklahoma. The general mailing address is Stillwater and the headquarters address for the AIBS meetings is 107 Whitehurst Hall, Stillwater, Oklahoma. Stillwater is situated in the north central part of the state about equal distance from both Oklahoma City and Tulsa. It is 282 miles north of Dallas, Texas and 135 miles southeast of Wichita, Kansas.

Highways: Stillwater and the University can be reached from the north on state highway 40 which connects with US highway 77 at Ponca City; and from the south on state highway 40 which terminates at its intersection with US highway 66 and the Oklahoma City-Tulsa toll road (turnpike); and from the west or east on state highway 51. If traveling from the east on US 66 pick up state highway 51 at Tulsa. If coming from the west on US 66 take US 77 north from Oklahoma City to the intersection of state highway 51 west of Stillwater.

Railroad: The Santa Fe stops at Perry, Oklahoma, 24 miles away, where bus or car transportation will be available to Stillwater.

Airlines: Stillwater is served by Central Airlines. Connections may be made at Tulsa or Oklahoma City. Central will provide additional flights to Stillwater as the demand warrants and to the extent possible. Ordinarily, Central does not fly on Saturdays. Central Airlines leave Oklahoma City 2:40 P.M., arrive Stillwater 3:12 P.M. and leave Tulsa 5:05 P.M., arrive Stillwater 5:45 P.M. Limousine and rent-a-car service to Stillwater will be available at both Tulsa and Oklahoma City airports. Taxi service is available from the Stillwater airport to the University campus.

Bus Service: The MK&O lines operate buses into Stillwater from Oklahoma City, Tulsa, Ponca City and Shawnee connecting with cross country schedules in all directions.

Present bus schedules are:

Leave Tulsa	*Arrive Stillwater*
7:45 A.M.	10:10 A.M.
11:40 A.M.	2:10 P.M.
2:45 P.M.	5:05 P.M.
5:20 P.M.	8:05 P.M.

Leave Oklahoma City	*Arrive Stillwater*
8:20 A.M.	10:10 A.M.
12:15 P.M.	2:10 P.M.
3:10 P.M.	5:05 P.M.
6:15 P.M.	8:05 P.M.

Special Arrangements: Arrangements have been made with Central Airlines to run second sections of their flights on Sunday, August 28 and Wednesday, August 31 for the accommodation of enrollees at the conference. Please indicate with your preregistration your expected time of arrival in Tulsa or Oklahoma City.

Other Transportation: Avis air-taxi in Tulsa and Catlin air-taxi in Oklahoma City are available. These are small planes carrying three passengers. Fare from Tulsa is $30.80 and from Oklahoma City, $21.00.

Avis, Hertz and National Rent-a-car service is also available at both airports. Rates for each company are the same.

Field Trips

American Society of Limnology and Oceanography

1. Sunday, August 28, 1960, 7:30 a.m. With **Ecological Society**. North-central Oklahoma.

Lake Carl Blackwell, reservoir; Glass Mountains, desert; Cross-Timbers, interdigitation of prairie and scrub-oak forest; winter wheat region; cattle range; Canton Reservoir and public shooting area; Cimarron River, typical semi-arid region stream, with braided channel, quicksand, lee-side dunes; Cheyenne-Arapaho Indian reservation. Transportation by bus, lunch furnished. Cost approximately $4.25.

2. Sunday, August 28, 1960.

Short trip to Cimarron River, typical semi-arid region stream, with braided channel, quicksand, lee-side dunes, salt cedars. Collecting for typical southwestern phyllopod crustaceans in bottomland pools.

3. Thursday, September 1, 1960.

Pollution abatement programs of oil refineries, Ponca City, Oklahoma and Arkansas City, Kansas. Biological treatment of organic wastes. Activated sludge and ponding. Also, Arkansas River, typical southwestern stream.

Persons wishing to make any of these trips should notify Dr. W. H. Irwin, Department of Zoology, Oklahoma State University, Stillwater, Oklahoma, by August 1, 1960. Transportation will be furnished.

The American Society for Horticultural Science *will not* sponsor a Field Trip during the AIBS annual meetings because in late August few horticultural crops, except ornamentals, are evident in Oklahoma. In lieu of a field trip, each Horticulture Department and USDA Horticultural Station will be sent a descriptive brochure describing places of interest and a companion road map of Oklahoma. Those members traveling by automobile will find it pleasant to combine a vacation with their participation in the meetings.

Notes on Biologists

Since September, 1959, **Jacques S. Zaneveld**, formerly Director of the Caribbean Marine Biological Institute, Curacao, Netherlands Antilles, has held the position of Professor and Head of the Biology Department, College of William and Mary, Norfolk, Virginia. **Dr. K. H. Wagner**, who did occupy this position, is now with the Carolina Biological Supply Company, Elon College, North Carolina.

Dr. Herbert Eugene Longenecker, nationally known as a specialist in the field of biochemistry, will assume the presidency of Tulane University, New Orleans Louisiana, in September, 1960.

One of the foremost virologists and chemotherapy specialists in the country, **Dr. Frank L. Horsfall, Jr.**, has been appointed President and Director

of the Sloan-Kettering Institute for Cancer Research.

Dr. William L. Stern, formerly Assistant Professor of Wood Anatomy, Yale University School of Forestry, was appointed Curator of the Division of Woods at the Smithsonian Institution in Washington, D. C. as of June 1.

Beginning in July, **Dr. Alan J. Hodge,** will develop a new laboratory of electron microscopy as a professor at the California Institute of Technology.

The University of Georgia Marine Institute, Sapelo Island, Georgia, announced the appointment of **Dr. George H. Lauff** as director of the Institute, effective April 1. Dr. Lauff, who is secretary of the American Society of Limnology and Oceanography, came to the Institute from the University of Michigan, where he was associated with the Great Lakes Research Institute and the Department of Zoology. **Dr. Lawrence R. Pomeroy,** who has been Acting Director at Sapelo, will remain with the Institute and the University of Georgia to devote full time to research and teaching.

Dr. Clifford E. Lamotte has recently been appointed to a research position in the Biology Department at Princeton University, where he is working with **Professor William P. Jacobs** on a research project entitled "The Control of Differentiation and Growth in Higher Plants."

Dr. Fred S. Orcutt, was appointed head of the Biology Department at Virginia Polytechnic Institute. Dr. Orcutt is a member of the Governing Board of the AIBS.

The Head of the Department of Biochemistry and Nutrition at Virginia Polytechnic Institute, **Dr. R. W. Engel,** has recently returned from a trip around the world as a special consultant for the Department of Health, Education and Welfare.

Dr. Jacob A. Stekol, Senior Member of the Institute for Cancer Research, Fox Chase, Philadelphia, spent three weeks in Israel to lecture at the Weizmann Institute of Science in Rehovoth.

Dr. Robert T. Lalonde has recently been appointed to the staff of the State University College of Forestry at Syracuse University, New York, as research associate, forest chemistry.

New president of the Society of General Physiologists is **Dr. William D. McElroy,** Director of the McCollum-Pratt Institute and Chairman, Department of Biology, Johns Hopkins University.

Dr. Oswald Tippo, Eaton Professor of Botany and Chairman of the Department of Botany at Yale University, who was formerly Dean of the Graduate School of the University of Illinois, has been named Provost of the University of Colorado. He will serve as the senior dean and chief academic officer of the University, with the responsibility for the general academic administration. Dr. Tippo is chairman of the AIBS Committee on Education, and of the Secondary School Biological Sciences Film Series Steering Committee.

Gill Professor of Biology at Johns Hopkins University, **Dr. Carl P. Swanson,** presented a paper at the symposium on the comparative effects of ionizing, ultraviolet, visible and near-visible radiations, which was held in February at the University of Puerto Rico in San Juan.

The Allan Hancock Foundation for Scientific Research at the University of Southern California will have **Dr. Leslie A. Chambers** as its scientific director starting May 1. Dr. Chambers has been Director of Research since 1956 for the Los Angeles County Air Pollution Control District.

Dr. A. C. Hildreth, retired as Director of the United States Department of Agriculture Horticultural Field Station at Cheyenne, Wyoming, is now Director of the Denver, Colorado, Botanical Garden.

The National Science Foundation has announced that **Harve J. Carlson** has been appointed Program Director for Biological Facilities in the Division of Biological and Medical Sciences. Previously, he was head of the Microbiology Branch of the Office of Naval Research.

Dr. Alvin Nason, Associate Director of the McCollum-Pratt Institute, Johns Hopkins University, has been appointed editor of a new journal, *Analytical Biochemistry,* which is intended to serve as a source of information on new and improved methods in the various fields of biochemistry and biophysics.

In January **Dr. Donn E. Rosen,** formerly of the New York Zoological Society joined the staff of the University of Florida as Assistant Professor of Biology and Assistant Curator of the Museum. He is in charge of the rapidly growing collection of fishes.

Miss Anne Meachem, a graduate student at the University of Florida, has been awarded through the Florida State Museum, the Mercer Lee Price Research Grant for $1,000 to study zooarcheological remains recovered from Tikel, Guatemala.

Dr. and Mrs. Richard L. Weaver of Ann Arbor, Michigan, have each received Fulbright Lectureships to Pakistan for 1960–61. Dr. Weaver is Associate Professor of Conservation at the University of Michigan and Mrs. Weaver teaches science in the West Junior High School of Ypsilanti. They will be stationed at the University of Dacca in East Pakistan and will help establish workshops for teachers through an Extension Center.

The Massachusetts Horticultural Society has announced that its Jackson Dawson Medal was awarded to **Professor Karl Sax,** Visiting Professor in Botany, Yale University. This medal is awarded for skill in the science and practice of hybridization and propogation of hardy woody plants.

Culver Stockton College, Canton, Missouri, has awarded the honorary Doctor of Science degree to **Professor Ruskin S. Freer,** Chairman of the Division of Natural Sciences and Mathematics at Lynchburg College, Lynchburg, Virginia.

Dr. Richard M. Roppel has joined the staff of Battelle Memorial Institute in Columbus, Ohio, as Biophysicist in the Biosciences Division. He was formerly in the Biophysics Department at Yale University.

Recently named Assistant Surgeon General of the Public Health Service is **Dr. Arnold B. Kurlander,** formerly Deputy Chief of the Service's Bureau of Medical Services.

Reports of the Election of New Officers from the Societies

Officers of **The American Society of Animal Production** for 1960 are: President; Dr. J. K. Loosli, Department of Animal Husbandry, Cornell University. Vice President; Dr. H. H. Stonaker, Department of Animal Husbandry, Colorado State University, Fort Collins. North Atlantic Sectional Vice President; Dr. W. W. Green, University of Maryland, College Park. Southern Sectional Vice President; Dr. J. A. Whatley, Jr., Oklahoma State University, Stillwater. Western Sectional Vice President; Dr. G. P. Lofgreen, University of California, Davis. Director; Dr. W. P. Garrigus, Department of Animal Husbandry, University of Kentucky, Lexington. For the period of 1960–62, Dr. C. E. Terrill of the Animal Husbandry Research Division, Agricultural Research Center, Beltsville, Maryland, will be Secretary-Treasurer. Dr. W. D. Gallup, Department

of Biochemistry, Oklahoma State University, Stillwater, will be Editor of the *Journal of Animal Science* for an indefinite period.

The Southern Section of the American Society of Plant Physiologists met February 1 to 3 with the Association of Southern Agricultural Workers at Birmingham, Alabama. During the meetings, the first annual graduate student award was given to the two graduate students presenting the best papers; Theodore Holmsen of the Unisity of Florida, and Gene Guinn of Texas Agricultural Experiment Station. The following officers were elected for 1960: Chairman; Dr. Robert E. Burns, United States Department of Agriculture Experiment Station, Georgia. Vice-Chairman; Dr. Howard E. Joham, Texas Agricultural Experiment Station. Secretary-Treasurer; Dr. Robert D. Powell, University of Florida. Members of the Executive Committee; Dr. Aubrey Naylor, Duke University; Dr. Wayne C. Hall, Texas Agricultural Experiment Station. Dr. Howard Teas, U. of Florida, is the Southern Section representative to the American Society of Plant Physiologists.

New officers have been reported by the **Society of Systemic Zoology** for 1960. President; W. I. Follett, California Academy of Science. President-Elect; R. E. Blackwelder, Southern Illinois University. Secretary; R. T. Abbott, Philadelphia Academy of Science. Treasurer; H. H. Hobbs, Jr., University of Virginia. Editor of *Systematic Zoology;* L. H. Hyman, American Museum of Natural History. Business Manager of *Systematic Zoology;* J. M. Savage, University of Southern California. Program Chairman; C. F. Lytle, Indiana University.

New officers for 1960 of the **American Society of Naturalists** are: President; Dr. Leslie C. Dunn, Department of Zoology, Columbia University, New York City. Vice President; Dr. Reed C. Collins, Herbarium, Harvard University. Secretary; Dr. Earl L. Green, Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine. Treasurer; Dr. Nelson T. Spratt, Department of Biology, University of Minnesota.

The American Society of Ichthyologists and Herpetologists reports the following officers: President; Norman E. Hartweg, University Museums, University of Michigan. President-Elect; George A. Moore, Department of Zoology, Agricultural and Mechanical College, Stillwater, Oklahoma. Vice-President for Conservation; Charles E. Shaw, San Diego, California Zoo. Vice President for Finance; Giles W. Mead, U.S. Fish and Wildlife Service, Washington, D.C. Vice President for Membership; Royal D. Suttkus, Department of Zoology, Tulane University. Treasurer; James E. Böhlke, Academy of Natural Sciences, Philadelphia. Secretary; Roger Conant, Philadelphia Zoological Garden. Publications Secretary; N. Bayard Green, Department of Zoology, Marshall College, Huntington, West Virginia. Managing Editor; David L. Jameson, Department of Biology, San Diego State College. The Ichthiological Editor is Romeo Mansueti, Chesapeake Biological Laboratory, Solomons, Maryland, and the Herpetological Editor is Robert F. Inger, Chicago Natural History Museum.

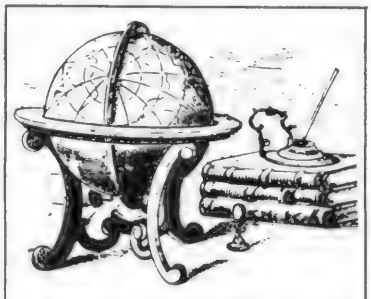
Recent Deaths Among Biologists

Ross Granville Harrison, retired Sterling Professor of Biology, Yale University. September 30, 1959.

Harley Harris Bartlett, Emeritus Professor, The University of Michigan, February 21, 1960.

Dr. George A. Edwards, Associate Research Scientist in Micromorphology at the Division of Laboratories and Research, New York State Department of Health, Albany. March 1, 1960.

We very much regret that the name of **Ivey Foreman Lewis** appeared in error in this column in the February issue.



AIBS REPORTS

On February 11 the new **AIBS Film Series** had its "world premiere" for scientists, educators and governmental workers at the Cosmos Club in Washington, D.C. Two of the 120 half-hour programs, which are to be ready for classroom use in September, were shown. Dr. H. Burr Roney, Project Director, Dr. James G. Dickson, AIBS President, and Dr. Hiden T. Cox, Executive Director, held a press conference after the showing.

Proceedings of the Symposium on **Biological Aspects of Aging** will be published by the AIBS during the next few months. A grant of $9,100 from the National Science Foundation will support the program.

The International Association of Dental Research, an AIBS Affiliate Society, has completed an agreement to avail itself of the AIBS Business Management Service, which will handle the routine functions of the office of the Association's Secretary-Treasurer, Dr. Dan Y. Burrill.

The AIBS has been awarded a grant of $32,246 by the **National Institutes of Health** for the preparation, publication, and distribution of **An Annotated Bibliography of Influenza.** This project will consist of two categories. Category I will be a single volume containing all references to this subject for the period January 1, 1957 to December 31, 1959. Category II, a current bibliography, will be published in quarterly supplements. It is anticipated that this second category will continue on an annual basis.

Dr. Burr Roney, Director of the AIBS Secondary School Biological Sciences Films Series, has been appointed a member of the Regional Advisory Council on Educational Television of the Southern Regional Education Board. The Council will study ways in which the SREB may assist higher institutions in the Southern States to use educational television more effectively.

Dr. John R. Olive, Assistant Executive Director of the AIBS, represented the AIBS at the **XXVth North American Wildlife and Natural Resources Conference** which was held at the Statler-Hilton Hotel, Dallas, Texas, March 7–9. Dr. Olive addressed the Cooperative Wildlife Research Unit Leaders and associated universities' scientific and administrative personnel.

Egbert H. Walker, director of the project to prepare a supplement to the "Bibliography of Eastern Asiatic Botany" by E. D. Merrill and E. H. Walker, has issued a seventh quarterly report. The most significant progress has been the practical completion of the addition of entries and the near completion of the manuscript for the citations. All operations in the next quarter will be carried out in Japan, where the printing will be done. This project is sponsored by the AIBS with support of the **National Science Foundation.**

ONR Activities

The Committee on Shark Research reports that, to date, nine panel meetings have been held. Dr. Perry Gilbert is Chairman of the Committee.

The AIBS is cooperating with the Biology Branch, Office of Naval Research, and the New York Academy of Sciences in the sponsorship of a conference on **Biochemistry and Pharmacology of Compounds Derived from Marine Organisms,** April 6–8 at the Barbizon-Plaza Hotel, New York City.

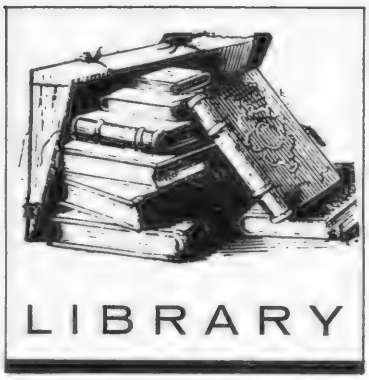
In cooperation with the Biology Branch, ONR, the AIBS is sponsoring the **XXVth Cold Spring Harbor Symposium on Quantitative Biology.** The Symposium will be held June 5 through 14 at the Long Island Biological Laboratory, Cold Spring Harbor, New York. The subject of the conference will be Biological Clocks and Animal Navigation. (A number of foreign scientists are expected to participate.) For further information, please write to the Long Island Biological Association, Cold Spring Harbor, New York.

AEC-NIH Activities

AIBS-AEC-NIH—Radiologic Life Shortening and Aging Panel Chairmen met April 12th at the Conrad Hilton Hotel, Chicago, Illinois. With Dr. Philip Handler as acting Chairman, future activities of the Committee were discussed.

Placement Service

Employers of biologists seeking assistance in placement are cordially invited to visit the AIBS Placement Service Office. Current applications of qualified biologists are available for your inspection. Book #1, **AIBS Placement Service Directory** is currently available at the nominal cost of $1. The publication lists 197 resumes of the qualifications, etc., of biologists seeking positions. Employers who have current or anticipated vacancies are urged to register the positions with the AIBS Placement Service. For further details, please write directly to: The AIBS Placement Service, 2000 P Street, N.W., Washington 6, D. C. **Notice to Registrants:** Applications are being accepted for listing in the June 1960 (Book #2) Placement Service Directory. These applications will be included in the Placement Service Open Records during the 11th Annual AIBS Meetings of Biological Societies (August 28–September 1, Oklahoma State University). Excellent accommodations have been reserved for the function of the Placement Service during the period of the convention.



In order to broaden the scope of the Biology Library Section, we invite scientists interested in reviewing to list their names and special fields with the Editor of the BULLETIN so that appropriate books may be sent to them.

One copy of each publication submitted for listing should be sent to the Editor, AIBS BULLETIN, American Institute of Biological Sciences, 2000 P Street, N.W., Washington 6, D.C. Only books published within a year of receipt will be reviewed. Books marked with a ★ are those published by Bulletin advertisers.

Action for Science under NDEA: Report of an Association Conference on the National Defense Education Act of 1958. 23 pp., National Science Teachers Association, 1201—16th Street, N.W., Washington 6, D. C. (1959). Single copies free; quantity orders, 15 cents each.

This booklet, intended as a service for science teachers and school administrators, summarizes the work of a special committee organized by the National Science Teachers' Association last October. NSTA's intention is to provide science teachers with "real help" in understanding the aid available to schools under Title III of the National Defense Education Act of 1958. Guiding principles are suggested for selection of facilities and equipment, planning minor remodeling and setting up a system of priorities.

Also suggested are criteria for minor remodeling, as well as ten "things to do" which should enable interested groups to get into more efficient action.

The report is appendaged with a brief but timely bibliography and a personnel list of the work-conference. *J. P. McMenamin, American Institute of Biological Sciences.*

★Plant Life. LORUS J. MILNE AND MARGERY MILNE. 283 pp., illus. Prentice-Hall, Inc., Englewood Cliffs, N. J. (1959).

A companion volume to *Animal Life*, by the same authors, this book gives a concise and up-to-date overview of the field of botany. In their thoughtful preface, the authors indicate that their goal is "to provide a rounded introduction to living things, particularly as they relate to man and he to them; and to arouse a broad interest in and awareness of progress in the biological sciences." Their policy in one area deserves a quote, "We have sought to include only the terminology required for adequate discussion, and to emphasize those terms which a generally educated reader is likely to find in newspapers, magazines, and other non-technical reports of scientific achievement. . . . We would have terminology serve only as the pegs upon which to spread a network of comprehension." Further, "Botany is an advancing science, and we have tried to emphasize its dynamic aspects. Many of its modern frontiers lie on the border of physics, of chemistry, and of the invisibly small. A century ago, no one was concerned with atomic structures or materials. The Botanist then had no understanding of genetics. Without radioactive trace elements he could not follow the translocation of chemical materials within the plant. The borderline between the living and the non-living had not been drawn, and then questioned. All of these matters receive consideration in this book."

In my opinion, the authors have very well lived up to their prefatory promises. The clear and interesting style of this extremely well-written book, the excellent illustrations—mostly photographs—and the well-chosen quotations combine to produce an outstanding piece of work. Unfortunately the authors and the publisher both refrain from identifying the audience for whom their book is intended. However, it seems to be well designed for the rare high school course in botany which attracts only the better students, for junior college and college courses, especially those that have a two-term botany-zoology sequence, and for the educated lay reader. Even the professional botanist who reads this book carefully will come away with new ideas and a better understanding of plants and their functions. In a day when too many elementary texts in biology still, for reasons of timidity or expediency, omit any mention of evolution, it is a pleasure to find a straightforward and uninhibited exposition of evolution-

ary theory. The final chapter, "Looking Toward the Future," is a novel feature for a book of this sort and is stimulating indeed in its relating of plant science to other activities of man. *William C. Steere, New York Botanical Garden.*

Human Biochemical Genetics. H. HARRIS. 310 pp. Cambridge University Press, 32 E. 57th St., New York. (1959) $7.00.

"Look into the seeds of time, and say which grain will grow, and which will not." (Macbeth.)

The investigation started by A. E. Garrod in 1902, "The incidence of alcaptonuria, a study in chemical individuality", has grown into the modern field of biochemical genetics. The problem of the genetic control of metabolism that Garrod examined with such insight has become one of the central problems of biology.

H. Harris in his admirable book discusses the hundreds of human "Inborn Errors" that have been described since Garrod's time, not as a mere list of diseases, but with an understanding of their genetic and biochemical importance. The introductory chapter and the chapters on current theories of gene action and on population genetics are concise and clear and serve as a framework for the critical, detailed discussion of the many biochemical genetic defects. The book has chapters on defects in amino acid metabolism, defects in carbohydrate metabolism, the abnormal hemoglobins, and miscellaneous biochemical disorders, as well as chapters on blood groups and plasma proteins. The review of the hemoglobins is of interest since this field is contributing much to biology as a whole; it is becoming apparent that variation within a species is at the level of the protein molecule and therefore that evolution may well be molecular evolution.

The physician, medical student, geneticist and biochemist will each find this book valuable. Added bonuses are a pleasing English style and a reasonable cost. *Bruce N. Ames, National Institutes of Health, Bethesda, Maryland.*

★Fresh-water Biology. Edited by W. T. EDMONDSON. Second Edition. 1,248 pp., illus. John Wiley & Sons, Inc., New York. (1959) $34.50.

Since establishment of the final plan in 1951 for the second edition of Ward and Whipple's *Fresh-water Biology*, we have waited with considerable anticipation for the appearance of the new volume. This is now available and is a worthy successor of the original forty-one-year-old handbook.

The new edition retains the function of the original edition of making available a concise one-volume guide for identification of the fauna and flora of inland waters of North America above the Rio Grande, but is more specialized than its forerunner, and is almost entirely changed by extensive revision and rewriting. Material on internal parasites and aquatic vertebrates has been omitted; bacteria and vascular plants are considered in more detail. Fungi, bryophytes, tardigrades, and polychaetes are included for the first time. Much recent published and unpublished information has been incorporated. General sections on ecology and habits of groups treated in the original volume have been omitted, simply because the voluminous new knowledge available in these fields would expand the handbook excessively.

The new *Fresh-water Biology* consists essentially of a series of well illustrated easily followed keys, each preceded by explanatory material intended to aid the reader in their use. The keys are of the bracket type, and follow a uniform style throughout the volume. The user of the handbook is expected to possess a general knowledge of the morphology and life history of the groups he intends to study. Different groups or organisms are given different treatment; many smaller taxa are keyed to species, while larger groups are taken only to genera. Each chapter is followed by a valuable list of references to major monographs and literature compilations. The closing chapter of the book by W. T. Edmondson presents a brief summary of methods of collection and preservation of organisms. An index at the back of the book contains mainly the names of all taxa identified in the keys, and was compiled principally to aid in locating names of organisms in the keys.

The new handbook derives its high quality not only from evident editorial excellence but from the painstaking efforts of an impressively long list of collaborating specialists. The names of these systematists is given with the group of organisms treated and in the order of their appearance in the handbook: Protista, R. Y. Stanier; Bacteria, C. B. van Niel, R. Y. Stanier; Fungi, F. K. Sparrow, W. W. Scott; Myxophyceae, F. Drouet; Algae, R. H. Thompson; Bacillariophyceae, Ruth Patrick; Zooflagellates, J. B. Lackey; Rhizopoda and Actinopoda, G. Deflandre; Ciliophora, L. E. Noland; Porifera, Minna E. Jewell; Coelenterata, Libbie H. Hyman; Turbellaria, Libbie H. Hyman, E. R. Jones; Nemertea, W. R. Coe; Nemata, B. G. Chitwood, M. W. Allen; Gordiida, B. G. Chitwood; Gastrotricha, R. B. Brunson; Rotifera, W. T. Edmondson; Bryozoa, Mary D. Rogick; Tardigrada, E. Marcus; Oligochaeta, C. F. Goodnight; Polychaeta, Olga Hartman; Hirudinea, J. P. Moore; Anostraca, R. W. Dexter; Notostraca, F. Linder; Conchostraca, N. T. Mattox; Cladocera, J. L. Brooks; Ostracoda, W. L. Tressler; Copepoda, Mildred S. Wilson, H. C. Yeatman; Malacostraca, F. A. Chace, J. G. Mackin, L. Hubricht, A. Banner, H. H. Hobbs; Aquatic Insecta, H. H. Ross; Ephemeroptera, G. F. Edmunds; Odonata, Leonora K. Gloyd, M. Wright; Plecoptera, W. E. Ricker; Hemiptera, H. B. Hungerford; Neuroptera, A. B. Gurney, Sophy Parfin; Coleoptera, H. B. Leech, M. W. Sanderson; Trichoptera. H. H. Ross; Lepidoptera, P. S. Welch; Diptera, M. T. James; Acari, I. M. Newell; Mollusca, W. J. Clench; Bryophyta, H. S. Conrad; Vascular Plants, W. C. Muenscher.

A special feature of the handbook is the use of some 2,548 figures, as line drawings, to illustrate the keys and the introductory sections to these. Although the drawings are generally of superior quality, those of the Fungi, Algae, Zooflagellates, Ciliophora, Nemata, Rotifera, Cladocera, Calanoida, Harpacticoida, Odonata, Coleoptera, Trichoptera Diptera, Mollusca, and Vascular Plants merit special mention. Another very useful characteristic of the book is the utilization of bold type for figure numbers under illustrations, which, especially on pages with many illustrations, facilitates matching illustrations with corresponding legends. The chapter on the Bacillariophyceae contains a useful glossary of terms; in view of the technical presentation of some of the other groups of organisms, it is probable that glossaries with these would help the less advanced reader. The entire volume is relatively free of errors, and is printed in readable type on good quality paper. The binding is attractive, and the book opens readily at any page.

This volume should constitute a valuable guide to identification of fresh-water organisms, and be welcome in the libraries of advanced students of zoology, botany, and ecology, systematists, limnologists, fisheries biologists, and sanitary engineers. Dr. Edmondson and his collaborators are to be congratulated for pursuing the arduous task of revision to its completion.

As a marine biologist I find myself wishing that I were reviewing a similar volume on the systematics of coastal marine organisms of North America; unfortunately, none exists.

Perhaps the fine example established by *Fresh-water* Biology will motivate the preparation of a companion Volume for organisms of the coastal areas of this continent. *Melbourne R. Carriker, University of North Carolina.*

★The Science of Biology. PAUL B. WEISZ. McGraw-Hill Book, Co., Inc., New York. (1959) 796 pp. $7.95.

The combination of a lucidly written text and skillfully executed illustrations makes Weisz' volume of real value. The exposition of contemporary concepts is imaginative and thorough, particularly in the early sections where the origins of life are discussed. With unusual facility the contributions of chemistry, physics, ecology, the behavioral sciences, genetics, and taxonomy to our present understanding are drawn together into a convincing rationale.

Following an introductory discussion of the nature of science, the text is divided into six sections considering in order (1) biological organization beginning with the probable origin of life and progressing through increasingly complex biological associations to ecology, (2) the composition and organization of living material, (3) metabolism and physiology, (4) metabolic control, (5) the anatomy and physiology of reproduction, and (6) genetics and evolution. Each chapter is appended with a list of references for collateral reading and a brief series of review questions.

Quoting the preface, "Designed to serve both the terminal student of biology and the prospective major, this book above all attempts to provide *understanding* of the biological process and principles. . . . Yet it remains within the grasp of the beginner." The attempt to fulfill two such divergent functions has created real problems for classroom use of the text, however.

Throughout most of the discussions biochemistry plays a dominant role. An effort has been made to incorporate enough elementary chemistry into the text to make it understandable to the beginner. But without background in organic chemistry it is doubtful that the biochemistry can be meaningful. In addition, there are errors in the chemistry itself, for example in the stereochemical argument on page 19, in the structural formulas on page 27, and in the statement regarding the stability of nucleoproteins on page 31. Certainly only the most precocious of beginning students could cross this recurrent biochemical hurdle.

The second limitation derives from the author's desire to emphasize an understanding of processes and principles—to deal with concepts rather than to catalog minutae. Mastery of any area of human knowledge involves preliminary learning of a body of almost purely factual material largely through memorization. This elementary knowledge is indispensable to any real appreciation of the concepts and principles, glamorous as the latter may be to the teacher and scholar. Arithmetic is fundamental to all higher mathematics, grammar to creative literature, and chemistry to metabolism. For the biological scientist, the role of taxonomy seems, to the reviewer, to be similarly fundamental. Weisz apparently does not agree, for taxonomy is treated only cursorily.

Because of these two characteristics of the text, the extensive use of biochemistry and the neglect of taxonomy, it is doubtful that the author has achieved his objective of providing a text of widespread use by beginning students in biology.

The book should make excellent collateral reading for advanced majors in biology or might easily form the basis for a one-semester course for advanced students. *Kendall W. King, Columbia University.*

★Developmental Cytology. Edited by DOROTHEA RUDNICK. 215 pp., illus., The Ronald Press Co., New York. (1959) $7.00.

This volume contains nine papers presented at the 16th Symposium of the Society for the Study of Growth and Development, held at Kingston, R. I., June 1957. The first contribution, by J. Preer, summarizes work on nucleo-cytoplasmic relationships in the Protozoa, with particular emphasis on *Paramecium.* The next four papers deal primarily with chromosomes and their role in differentiation and tumor genesis. C. Partanen and T. C. Hsu consider variations in chromosome number of higher plants, and animals respectively. Their approach is largely cytological, dealing with problems of ploidy in normal and neoplastic tissue. G. and E. Klein discuss the genetic basis of histocompatability in the mouse, and review the literature on abnormal chromosome numbers in tumors. W. Beermann ably discusses the role of differential gene activation in differentiation. His examples come mainly from his own extensive studies on the polytene chromosomes of the Diptera.

The metabolic role of the nucleolus in the fly, *Chironomus*, and the alga, *Acetabularia*, is considered by H. Stich. Two contributions give recent information on cell fine structure derived from electron microscopy. D. von Wettstein analyzes structural changes in chloroplasts under various physiological states and in different genetic stocks. A concise review of cytoplasmic ultrastructure is presented by D. W. Fawcett, who also considers changes which accompany various cell specializations. Finally, A. L. Lehninger reviews the extensive literature which correlates metabolic activity with identifiable cell components.

Despite their diversity of approach, these authors display a common interest in correlating the findings of cytology, genetics, and embryology into a coherent theory of differentiation. At the same time, their cautious conclusions and the absence of sweeping generalizations underlines the relative difficulty of the task. Students of the cell, particularly those oriented toward problems of differentiation, will find this volume a substantial contribution to their field. *Joseph G. Gall, University of Minnesota.*

★Regression Analysis. E. J. WILLIAMS. John Wiley and Sons, Inc., New York. 214 pp. (1959) $7.50.

The application of regression analysis and a limited amount of theory associated with such analyses are presented in this book. Williams has attempted to write for "research workers in the experimental science" and, consequently, has rather limited his discussion of accompanying theory. In his writing he has assumed that the reader is familiar with books on general statistical methods or has access to them. In addition, he has omitted machine calculation methods. The book contains the following chapters: linear regression, multiple and polynomial regression, regression equations requiring iterative calculation, choice among regression formulas, estimation from the regression equation, the analysis of covariance, the treatment of heterogeneous data, simultaneous regression equations, discriminant functions and functional relations. The methods are illustrated by real examples; however, the reader will find the examples are primarily from the field of wood technology and that the writer apparently has not searched the biological literature, or even other fields of study, for examples. William's introductory chapter is an excellent presentation on the use of statistics and should be read by all experimental scientists. Throughout the book William's general comments are enlightening; however, I can not help but feel that this book is beyond the grasp of most biologists. Persons with graduate

training in statistics will find the book very interesting but will be continually frustrated by the paucity of theory. Although the writer was attempting to write for the experimental scientists, at times he uses matrix algebra, calculus and theory of equations, subjects which I feel have been studied by only a very small number of such scientists.

Even considering the above limitations, the book is well written and should be of interest to the applied statistician. *Vincent Schultz, Environmental Sciences Branch, Division of Biology & Medicine, U.S. Atomic Energy Commission.*

★Physiology of Muscular Activity. PETER V. KARPOVICH. Fifth Edition, 368 pp. W. B. Saunders Company, Philadelphia. (1959) $5.50.

This book is written for those interested in athletics and physical education. The title encourages a scientist to open and read, but its contents will soon have him close it. The book, now in its fifth edition, was started by the late Dr. E. C. Schneider and is now continued by Dr. Karpovich. Its chapters cover all aspects of muscular activity with special emphasis on training and performance in the extreme activity demanded by athletics. The new material added in this edition includes a special chapter on muscle training and sections on "warming up," prediction of weight lifting records, comparison of isotonic and isometric methods of muscle training, the heart and training, relation of physical fitness and intelligence, and the effect of benzedrine on athletic performance.

Since this reviewer must place himself in the class mentioned in the book as "a miracle of inactivity," it is most encouraging to find that the full quotation of Juvenal's most famous dictum is "Orandum est ut sit mens sana in corpore sano." "One prays that a sound mind would be in a sound body." This changes the whole meaning from a statement of an inevitable association to a prayer for a double blessing. This typifies one of the excellent qualities of this book; the authors have examined much of the folk lore which has grown up around athletics and debunk the bulk of it. By reporting their own work and reviewing the immense literature, many doctrines of warming up, training, diet and tactics are examined and the majority are effectively deflated. There is a certain whimsiness and hopelessness about the writing; for example, in examining the effects of caffeine, the author reports either no effect or a slight improvement, but admits that its use will continue to be prohibited.

Valuable as this book may be for those interested in athletics, there is a strong scientific objection to the technique. A thin veneer of basic science is spread as decoration or camouflage over what varies from respectable "arbeits—physiologie" to pure anecdote. The latest Huxley-Hanson model of muscle structure is mentioned but there is no reference to the work of Kuffler and others on the central control of muscle spindles. This basic research will certainly have a much greater effect on the control of muscle movement than knowledge of the structure of muscle. To take another example, the highly specific statement is made that during training the transmission of nerve impulses across the motor end plate is facilitated but no evidence is presented for this revolutionary statement. The only paragraph which mentions the work of Magnus and Sherrington ends with the advice that deaf mutes should not be allowed to swim after dark. All this represents a misuse of basic science used to give an air of respectability to subsequent discussions which should stand on their own. The author is faced with the dilemma of wanting to inform his readers of the basic factors involved in their practical problems and yet they are not able to assess these factors critically. One section begins with the effect of temperature on muscle and proceeds with a practical discussion of "warming up" for athletics in which the phrase is taken literally. This unsuccessful attempt to tie a single phenomenon of peripheral muscular physiology to a study of the behavior of a whole man can only confuse the reader and it would have been far simpler to state the interesting data which the author has on warming up without attempting to relate them to half understood physiological and psychological factors.

In summary, then, this book contains a most interesting collection of studies on muscular and athletic performance in man, but this data is unsuccessfully tied to physiology and psychology largely because the required facts are not known and some of the known facts are misused. *Patrick D. Wall, Massachusetts Institute of Technology, Cambridge, Massachusetts.*

★Data for Biochemical Research. Edited by R. M. C. DAWSON, DAPHNE C. ELLIOTT and K. M. JONES, 299 pp. Oxford University Press, London. (1959) $10.10.

This book is a modified "Chemical Handbook" prepared especially for the biochemist. It contains first, 18 tables (177 pages), listing the chemical substances of interest to biochemists, formulae, molecular weights, solubilities, etc., but more valuable—references to preparation, to estimation and containing some further general remarks likely to be valuable, i.e., notes on stability, on decomposition products, on nature of solutions, etc. In these 18 tables, the compounds are separated on the basis of their nature, e.g., amino acids, phosphate esters, etc., rather than mere alphabetical listing, including tables on vitamins, antimetabolites, drugs, chelating agents, and macromolecules.

In addition, there are 14 more tables, several of the usual sorts—molecular weight, normalities, indicators, etc.—but two are of unique use to biochemists. The first is a list of enzymes commonly used as laboratory reagents, including activators, inhibitors, preparations, and sources. The second is a table, of over 60 pages, describing methods and reagents for the detection of biochemically interesting compounds on paper.

This book is indeed a most useful one for the biochemical laboratory. One is glad that the authors have done this work (and equally glad that one does not have to do it oneself), and that they have compressed an enormous amount of useful information into a 300-page book. *Wayne W. Umbreit, Department of Bacteriology, Rutgers University, New Brunswick, N. J.*

Plant Physiology: A Treatise. Volume II: Plants in Relation to Water and Solutes. F. C. STEWARD, Ed. Academic Press, Inc., New York (1959) xvii + 758 pp. $22.00.

Since the first announcement of this six volume treatise on plant physiology many, if not most, plant physiologists as well as scientists in related areas have been looking forward with anticipation to the publication of the first volume (which has turned out to be II rather than I). Few will be disappointed and most will find that their expectations have been exceeded. The standing of the editor and of the various contributors indicated that the treatment would be authoritative and up to date, but the extra dividends of attractive format, pleasing and very legible type, and an amazingly uniform lucid style of writing would not necessarily have been anticipated. One suspects that the editor may have had a considerable part in bringing about the latter. If so, we can anticipate that the remaining volumes will be as well-written and readable as this one, in contrast with the rather choppy style common in review papers. Though the reviewer has not read the

volume from cover to cover, the obscurities and minor errors that creep into even the best written books appear to be unusually few. Some individuals may object to certain choices of terminology (as in osmosis), to what they consider as inadequate treatment of certain topics (as in the two paragraphs devoted to root pressure), or to slighting of their favorite theories. In general, however, the contributors have done an excellent job of selecting material for inclusion, of discussing each area with a considerable degree of thoroughness, and of including the older basic knowledge as well as more recent developments. Of course, even seven large volumes (Volume I will be in two parts) are not enough to permit a really complete summary of plant physiological knowledge.

Eight plant physiologists have contributed to this volume: Runar Collander on cell membranes, T. A. Bennet-Clark on water relations of cells, O. V. S. Heath on water relations of stomata and stomatal movements, F. C. Steward and J. F. Sutcliffe on inorganic salt absorption and accumulation, C. A. Swanson on translocation of organic solutes, O. Biddulph on the translocation of inorganic solutes, and Paul J. Kramer on transpiration and the water economy of plants.

Perhaps the weakest feature of the book is the subject index, which is quite incomplete, particularly as regards cross references, though this may not prove to be too great a handicap in view of the detailed table of contents at the beginning of each chapter. The author index and the index to plant species appear to be comprehensive and should be useful features of the book.

Turning from the volume itself to the particular role the treatise as a whole will play in the ever-expanding literature of plant physiology, the question arises as to just how this treatise makes a contribution beyond those of the *Encyclopedia of Plant Physiology*, the numerous review papers, present and future monographs, and the more comprehensive textbooks. The following quotations from the preface reveal the role of the treatise as visualized by the editor:

"Until the end of the 19th century it was still possible for a comprehensive treatment of Plant Physiology to be written by one author, and the treatise of Pfeffer, in three volumes . . . is the outstanding example . . .

"The aim of this treatise, some fifty or more years after Pfeffer, is to *say* what Plant Physiology is about and to do this in sufficient detail and with sufficient analysis of, and even extracts from, the ever-expanding literature, so that each volume will be in a large measure self-contained.

"Plant physiologists will find the treatment is sufficiently detailed to benefit their research in their own specialized fields and that the scope is broad enough to make reading of all portions of the work both stimulating and profitable. This treatise is, therefore, designed for the use of advanced and postgraduate students, teachers, research workers, and investigators in other fields of knowledge who need information about the present status of plant physiology."

Strictly as a reference work, the *Encyclopedia of Plant Physiology* has the edge over the treatise being reviewed in comprehensiveness though not in recency. Together, the two sets provide plant physiologists with an excellent and comprehensive reference base, wished-for but unavailable and not too hopefully anticipated only a few years ago. A minor danger of such reference works, particularly in areas outside one's own specialty, is that some valuable contributions that do not happen to be included may tend to become lost. An unavoidable drawback is that any scientific work of this type has built-in obsolescence. The common observation that a science book is out of date the moment it comes from the presses applies with increasing force as the comprehensiveness of a work increases. Of course, review papers take care of the new developments, but one hopes that the editor and publishers will find it possible to revise the work at reasonable intervals.

From the standpoint of readability the treatise is far ahead, not only of the ordinary review paper, but also the *Encyclopedia*, even when the fact that many plant physiologists do not read German as easily and rapidly as they should is ignored and only the English contributions are considered. The readability of the treatise will undoubtedly result in extensive if not complete perusal of the set by many plant physiologists for background information outside their own specialties. This may prove to be the most valuable contribution of the treatise. Another possible use, not mentioned by the editor, is that individual volumes could make good textbooks for graduate courses in specialized areas of plant physiology.

Every plant physiologist and advanced graduate student in plant physiology, as well as many others in related sciences, should have this set available in his personal library rather than having to rely on his institutional library for it. Unfortunately, the price is a serious drawback to many even when one volume is considered, although the book is well worth the money as present prices go. It would seem that foundations interested in the advancement of science might well consider partial subsidy of works of this type to bring their cost down to a level that the potential users can afford. *Victor A. Greulach, University of North Carolina.*

Textbook of Microbiology. WILLIAM BURROWS. 954 pp., 301 figs. W. B. Saunders Company, Philadelphia (1959) $14.00.

The fact that this is the seventeenth edition of "Burrows" would seem to indicate a wide and continuing usefulness. Most of the revision of the present edition has to do with advances in the knowledge of the structure of bacteria and their metabolism and rather less with the diseases to which twenty-five of the forty chapters are devoted. Another five chapters have to do with the more general aspects of medical bacteriology and with immunity. As such, this book is, as it has always been, heavily overweighted to the applied medical side and any course based on it must supplement, by lectures, the fundamental aspects. Since, however, this has always been the situation with this book, and since it continues to be widely used, this emphasis does not seem to be a serious drawback and may well be desirable. Basically, the book's pattern has not changed; this is a medical bacteriology and not a general bacteriology, and it will undoubtedly be widely used as its predecessors have been. *Wayne W. Umbreit, Department of Bacteriology, Rutgers University, New Brunswick, N. J.*

Plant Pathology: Problems and Progress 1908-1958. The University of Wisconsin Press, Madison, Wis. xix + 588 pages. (1959) $8.50.

This book is the product of 51 authors, five editors, and the American Phytopathological Society. It is, in fact, the Society's Golden Jubilee volume. It collects the major addresses and symposium papers presented by some of the world's most noted scientists before the 50th anniversary meeting of the Society at Bloomington, Indiana in August 1958.

Thus, "Plant Pathology" is a broad treatment of the science. It contains

something to interest every biologist, not only for plant pathologists, but also for specialists in such related sciences as genetics, physiology, and biochemistry; and indeed, there is much for young students of biology.

The book has an important place in the literature of plant pathology and of other biological sciences. Carefully, and to a degree philosophically, it develops the history of plant pathology and projects its future.

The book is in ten parts. Each part is devoted to a major division of the science. Most of the book—parts two through ten—contains the papers presented before the nine symposia of the Anniversary meeting. There are six papers on physiology, seven on genetics, seven on fungicides and the chemistry of fungicides, six on fungi, five on nematology, eight on the structure and the multiplication of viruses, and five on epidemiology.

The authors of these papers are among the most distinguished in their own fields. For example, G. J. M. van der Kerk, of the Institute for Organic Chemistry, The Netherlands, contributes a paper on the "Chemical Structure and Fungicidal Activity of Dithiocarbamic Acid Derivatives," and Gerhard Schramm, of the Max Planck Institute for Virus Research, Germany, discusses "The Role of the Nucleic Acid in the Infection with Tobacco Mosaic Virus."

It is significant that these two contributors came from foreign lands. Twenty-one of the 44 papers included in the symposia were presented by scientists brought here from England, Australia, South Africa, Germany, The Netherlands, Honduras, Mexico, and Canada.

Part One of the Golden Jubilee volume contains the seven major addresses concerned with the history and development of plant pathology. Again, the prestige of the authors and the quality of their papers are outstanding. E. C. Stakman of the University of Minnesota relates plant pathology to the world's scientific and social development; John A. Stevenson of the United States Department of Agriculture traces the development of the science in North America; and J. G. Harrar of the Rockefeller Foundation discusses an international approach to the study and control of plant diseases. Other contributors to this section are S. E. A. McCallan and George L. McNew of the Boyce Thompson Institute for Plant Research, J. C. Walker of the University of Wisconsin, and James G. Horsfall of the Connecticut Agricultural Experiment Station.

All in all, "Plant Pathology" reflects much credit on the various committees of the Society that were responsible for the presentation and publication of these papers, the contents of which point to the significant role of biological sciences in the future of mankind.

The editors and publisher should be complimented on the production of this book which not only is very readable but also is handsomely bound in gold. *Paul R. Miller, Crops Research Division, U. S. Department of Agriculture, Beltsville, Maryland.*

★All About Tropical Fish. D. MCINERNY and G. GERARD. 480 pp. illus. The Macmillan Co., New York (1959) $15.00.

Were an ichthyologist to see the title of this handsome book before he saw the volume itself, there is a good chance that he would consider it no further. Obviously not even a work many times this size could treat exhaustively with all tropical fishes, let alone those known to be suited for enjoyment in aquaria. Nevertheless, the choice and extent of the information included in this substantial volume are most satisfying, even to a professional fish biologist. The offering is furthermore greatly enriched by more than three hundred photographs, (by Brian Barrett) including more than a hundred excellently reproduced in color. The value of the illustrations is strongly enhanced by the prevalent inclusion of both sexes, with their careful designation. In capsule form, these plates offer one of the richest displays of sexual dimorphism in the animal world.

Nearly a third of "All about tropical fish" is an aquarist's *vade mecum.* Obvious care was taken, however, not only to provide instructions for building, setting up, and maintaining aquaria, but also to creating understanding of an aquarium as an ecosystem. Indeed, the first thirteen chapters are a skilful digest of information on the physiological ecology of fishes and the manipulation of an aquarium environment to meet the needs of finny inhabitants chosen for it.

Chapter titles encompass the following subjects: choice, setting, and maintenance of aquaria; aquarium limnology; dietetics of aquarium fishes; enemies, diseases, and humane treatment of animals; aquatic plants; biology of fishes; freshwater tropical aquarium fishes of more than twenty families; miscellaneous tropical marines.

The chapter on "Kindness and cruelties" is really quaint in its naiveté, although to some readers it may be annoyingly anthropomorphic. For example, "bullies abound in the fish world, as they do elsewhere" and "few aquarists realize the terror instilled into their pets by unskilled catching." Disposal of aquarium fish by flushing them down the toilet is regarded as "extremely cruel"!.

Although this work was obviously aimed at aquarists, it contains much of value for the student and the researcher in ichthyology as well as for teachers of ichthyology and behavioral biology. Considering the profusion of fishes (estimates of species numbers go as high as 40,000), relatively little information exists concerning most of them. Exceptions to this are most common among the food and game species and, as the present work so ably demonstrates, in the many aquarium kinds. In this book, there is a wealth of comparative, guideline information on such diverse subjects as courtship, nurture in relation to fecundity, gestation period, territoriality, genetics, change of habits with life history stage, principles of animal coloration (including sexual dichromatism), thermal and chemical preferenda, and space and nutritional requirements. It is a worthy addition to a field of literature long dominated in the English language by the works of Innes (*e.g.*, "Exotic Aquarium Fishes"), and Stoye ("Tropical Fishes for the Home Their Care and Propagation"). Much of the observational and experimental data included are firsthand experiences and are additions in fact to the knowledge of the groups represented. *K. F. Lagler, Department of Fisheries, University of Michigan, Ann Arbor.*

★Personal and Community Health. C. E. TURNER. 446 pp., illus. The C. V. Mosby Company, St. Louis, Mo. (1959) $5.50.

★Function of the Human Body. ARTHUR C. GUYTON. 584 pp., illus. W. B. Saunders Company, Philadelphia, Pa. (1959).

These two college texts represent a field of biology teaching which on the secondary school level has been usurped by the non-biology oriented teacher, and the same trend is now appearing in the colleges.

The Turner book is a standard college health text of long standing in its latest revision. There is still an emphasis on human anatomy with some physiology included. Each chapter seems to begin with an anatomical treatment followed by its health aspects. There is an interesting appendix explaining common prefixes and suffixes found in medicine. Also, there is a long and extensive treatment of common diseases included as an appendix.

The Guyton book is a new human physiology text for college students who are taking the course as a service offering for a variety of curricula. Diagrams are quite excellent. Chemistry background is not assumed, and the effort made to interpret the chemistry of human physiology to such students is very well done. There is an easy, readable style with an emphasis on human physiological problems of great interest to college students.

However, this seems to be a time when health books should assume a reasonable anatomical knowledge by the time the student reaches college. One of the telling criticisms made of health courses is the repetitiveness of much of the material included in such a course. One is obviously anatomy. While there is a health aspect discussed for each body system, a great deal of the chapters in the Turner work is devoted to anatomy. Safety is confined to one chapter. There is no discrete treatment of physical growth where the research is proving to be of significance and interest to the student.

The physiology text has taken up a great many malfunctions of bodily processes in order to better explain the normal. Homeostasis is a running theme. Of course, the college health course and the human physiology course for those students not bound for research are different courses, yet it is apparent in many colleges these are taken for the same reasons. Perhaps the time is now to establish a course with health overtones but with a solid physiological basis such as found in the Guyton text. I would like to see the text which combines the features of both these books for the student majoring in physical education, teaching, and related science fields of engineering, hygienists, etc. The material and treatment in both of these books would be a good place to begin. *Paul Klinge, Coordinator for School Science, Indiana University.*

★Methods of Correlation and Regression Analysis. MORDECAI EZEKIEL and KARL A. FOX. xv, 548 pp. John Wiley and Sons, Inc. N. Y. (1959). $10.95.

This is the third edition of a book that was published thirty years ago by the senior author. Many American biologists have used this book as a source of correlation procedures, possibly because of its title and availability. This I believe was a very unfortunate event which should be rectified by the appearance of other books on the subject. Throughout the book the authors have utilized examples from the business and economic fields, neglected the associated theory, used terminology that does not conform with current practice, made incorrect statements, and all in all have in the reviewer's opinion complicated or oversimplified the subject of correlation and regression analysis. Some of these objectives from a biologist's point-of-view may be justified by concluding that the book was written by economists and for economists with a very limited background in mathematics and statistics.

Although the authors admit the omission and commission of some of the above items to which the reviewer objects, one wonders whether or not there is a justification for such a book as described by the authors:

> "This book is not intended to cover the entire field of statistics, but rather, as its name indicates, that part of the field which is concerned with studying the relations between variables . . .
>
> "No attempt is made in the body of the text to present the mathematical theory on which the art of statistical analysis is based. Instead, the aim throughout has been to show how the various methods may be employed in practical research work, what their limitations are, and what the results really mean. Only the simplest of algebraic statements have been employed, and the practical procedure for each operation has been worked out step by step. It is believed that the material will be readily comprehensible to anyone who has had courses in elementary algebra."

By such a procedure the authors discuss: introductory concepts, simple linear and curvilinear regression, multiple linear and curvilinear regression, significance of regression and correlation results, miscellaneous topics and the "uses and philosophy of correlation and regression analysis." I feel quite sure that readers with a background in elementary algebra will be completely frustrated when reading this book while research workers, who should have inquisitive minds, will have the same feeling as a result of omission of at least simplified aspects of the theory. Fisher's and Student's papers of the twenties are presented as though they are something new, for the authors state,

> "During the last two decades, the English statisticians 'Student' and R. A. Fisher have been developing more exact methods of judging the reliability of conclusions, particularly where those conclusions involve correlation or are based on small samples. *These new methods have as yet received but little recognition from American statisticians* (reviewer's italics)."

I feel quite sure that there is not one *statistician* in this country who would agree with this statement. Anyone familiar with the fitting of a line *to data* by the method of least squares will realize that normal assumptions are involved only when conducting a test significance or establishing confidence limits for a parameter. Yet, the authors state early in the book (page 62), "The method by which this line is fitted rests upon the assumption that the scatter of the individual observations around the fitted line will approximate a normal distribution." They continually call the estimate of the error variance, e.g., $s^2_{y \cdot x}$, the "standard error of estimate" and fail to mention that the fitted regression can be used to estimate various parameters, each with its own standard error. If the dependent variate is zero when all the independent variates are zero, the authors state that the fitted line must go through the origin. This is a very poor procedure if one desires a best least squares fit to his data. Throughout the book they use the cumbersome procedure of using a divisor of n instead of $n-1$ when computing an estimate of the standard deviation and consequently must correct for this deviation from the accepted practice by appropriate adjustments on various formulas throughout the book.

Simple algebraic proofs or diagramatic explanations of the theory are omitted. Emphasis is placed on the presentation of machine calculation formulas and the omission of the basic formulas from which they were derived. Consequently, the equations have little meaning to the reader who is interested in *understanding* correlation and regression analysis.

The reviewer still believes that the two best books on regression analysis are those of Quenouille (1952. **Associated Measurements.** Academic Press, N. Y., N. Y.) and Williams (1959. **Regression Analysis.** John Wiley and Sons, Inc. N. Y., N. Y.) Although both books serve various purposes, I believe that Quenouille's book will best serve the needs of biologists. However, the biologist with a poor facility for mathematics will not understand either.

Irrespective of what the reviewer thinks of this book, Ezekiel and Fox should be given credit for attempting to present this material to nonstatisticians and their presentation should help to improve the next book on this subject. *Vincent Schultz, Ecologist, Environmental Sciences Branch, Division of Biology & Medicine, U. S. Atomic Energy Commission.*

★Fundamentals of Ornithology. JOSSELYN VAN TYNE and ANDREW J. BERBER. 624 pp., illus. (1959). John Wiley and Sons, New York. $11.75.

This is certainly the only volume produced in many years that can lay any claim to being a "Textbook of Bird Biology." Dr. Berger has thus placed himself in the debt of hundreds of teachers and thousands of students. Both groups have long suffered the agonies of mimeographed outlines, or worse. Make no mistake —this is not a volume designed for the beginner or the student who desires only a superficial knowledge of birds and their ways. The entire design and approach presupposes that the user is well grounded in the basic branches of biology. Berger states in the preface that Dr. Van Tyne, who planned and began the book before his death, hoped that, at least, it would provide a background for graduate work in ornithology. The completion of the work by Berger seems to have hewed neatly to the line which the perfectionist Van Tyne laid down.

Twelve chapters and 348 pages are devoted to such subjects as paleontology, anatomy, senses and behavior, distribution, flight, breeding behavior, social relations, etc. The 13th and final chapter devotes 166 pages to one-page summaries of each of the families of birds of the world. A glossary and short selected list of ornithological sources are provided.

Reviews pointing out typographical and artistic errors will certainly appear in the various ornithological journals and many will disagree with the authors on various major and minor points. I am sure, however, that all will be high in their general praise of this fine effort. I personally regret that more comparative biology was not included and that the glossary is not more nearly that which the publishers quite unjustifiably claim to be "the most complete glossary of ornithological terms since the publication in 1896 of *Newton's Dictionary of Birds.*" Too, the very attractive pen and ink sketches so ably executed by G. M. Sutton provide minor if any assistance in bird identification and could be well replaced with distribution maps.

The Fundamentals of Ornithology should do much to remind ornithologists (and others) that birds are simply another kind of animal and not something very special after all. It is a real pleasure to welcome the appearance of a very worthy addition to any biologist's bookshelf. *J. C. Dickinson, Jr., Florida State Museum, University of Florida, Gainesville.*

★Fishes of the Great Lakes Region. CARL L. HUBBS AND KARL F. LAGLER. 213 pps., 251 figs., 44 plates, 1 chart. Bulletin No. 26, Cranbook Institute of Science, Bloomfield Hills, Michigan. (1958) $5.00.

This is a revised edition of the widely used manual for the fishes of the Great Lakes region, written by two well-known authorities. No major changes have been made in the new edition. The introductory part retains the original definitions of terms and descriptions of methods of counting and measuring fish structures which have become standard procedure for ichthyologists. The introductory part has been enlarged by the addition of sections on the ecology of the Great Lakes waters and on fish names. Nineteen color plates have been added.

The major part of the book is devoted to keys and illustrations which aid in the identification of the 234 species and subspecies of fishes found in this region. The distribution and range of each fish is given in a brief paragraph. A short discussion of the habits, and of the angling methods for game fishes, is given for each family. A very useful chart of characters of the ciscoes has been added and should help greatly in the difficult identification of these fishes. Several species and subspecies have been added to the original list and several have been deleted, keeping the number described about the same as in the 1947 edition. The authors have been somewhat conservative in following the recent tendency to combine certain genera of fishes. Although conforming with many of the recent changes, they have retained several of the older generic names. They have also made a few name changes where they deemed the old name to be invalid. The book is primarily a technical manual and it remains an important working tool for ichthyologists, fishery biologists, and others who are interested in fishes. *Samuel Eddy, University of Minnesota.*

★Collecting, Preserving and Studying Insects. HAROLD OLDROYD. 327 pp., illus. The Macmillan Co., New York, New York. (1958) $5.00.

The title of this book clearly indicates its coverage. The first part, devoted to collecting, tells where to look for insects, and how to catch and trap them. Keeping, breeding and rearing, killing, and temporarily preserving the catch are discussed. Part II gives instructions for preparing and mounting for permanent preservation, examing insects in a collection and photography. The last section concerns the study of insects, including the principles of zoological classification and nomenclature, what are insects and their allies, and how insects are identified. Further chapters discuss additional reading in entomology and the description of new species.

The book is written for the adult who becomes interested in insects or for students of entomology who are in the beginning stages of developing a knowledge of this science. It has been carefully planned to answer the needs of these two groups. Professionals may also find much of value in the book, particularly as a ready source of general information. *Lewis Berner, University of Florida.*

Biochemical Preparations. Volume 6. Edited by CARL S. VESTLING. 105 pp. John Wiley & Sons, Inc., New York. (1958) $5.25.

The sixth volume in this distinguished series keeps the tradition of presenting very carefully worked out methods by which an investigator can prepare substances of biochemical interest. Each one of these procedures is worked out by one team of investigators and then is carefully checked by another group before being published. The result is an exceptionally useful set of directions for preparing these substances. This volume contains directions for 19 such preparations ranging from small molecules such as 2, 3-diphosphoglyceric acid through larger ones such as 3-hydroxy anthranilic acid and finally to ribonucleic acid, deoxyribonucleic acid, proteins such as insulin, and enzymes such as muscle phosphorylase. Each preparation has been annotated both by the men who made the original description and by those who checked the preparations. If the latter introduced any modifications, this is noted as well. Where it is applicable, data are presented by which the final product was characterized and its purity determined.

These procedures will be useful not only to investigators who wish to prepare these substances, which in general are difficult to obtain from commercial sources, but will also provide experience in biochemical methods for students in biochemistry courses. The book contains a cumulative index which gives references to all of the substances described in the previous volumes of this series as well as the sixth volume. *Claude A. Villee, Harvard University.*

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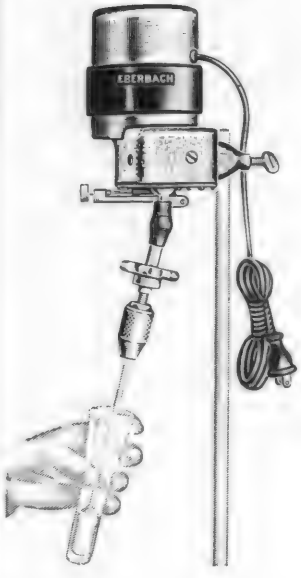

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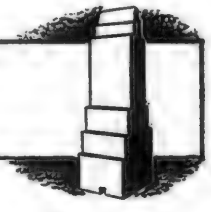

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Edited by Major General OTIS O. BENSON, JR., *and* HUBERTUS STRUGHOLD, *both of Aerospace Medical Center, Brooks Air Force Base, Texas. Arranged by* SOUTHWEST RESEARCH INSTITUTE. Proceedings of a symposium held at San Antonio, Texas —November 10-12, 1956—sponsored by The Air University School of Aviation Medicine. The book contains forty-four papers by forty-five authors. Greatest amount of attention is given to the environment of the astronaut. All of the extreme conditions to be encountered in space flight, and their effect on man, were presented. *1960. 645 pages. Prob. $12.50.*

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By LOUIS P. GEBHARDT, M.D., Ph.D.; and DEAN A. ANDERSON, M.S., Ph.D. 1958, 2nd edition, 261 pages, 7¾" x 10½", 15 illustrations. Price, $3.75.

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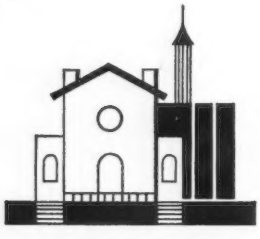
By BRUCE M. HARRISON, Ph.D., Sc.D., Emeritus Professor of Zoology, The University of Southern California, Los Angeles, California. 1956, 3rd edition, 217 pages, 8½" x 11", illustrated. Price, $3.50.



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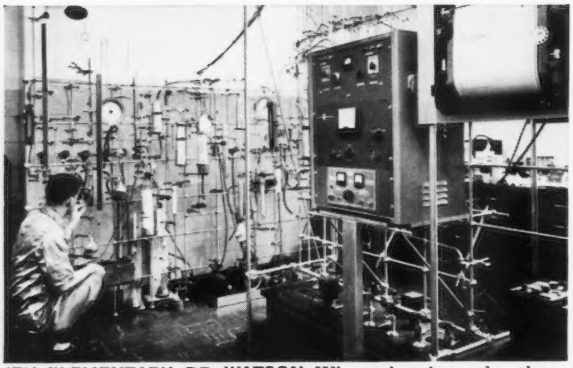
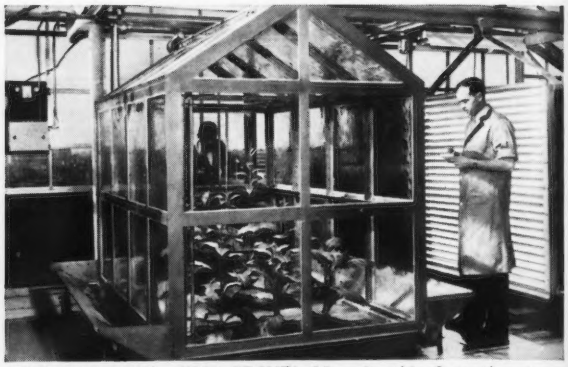
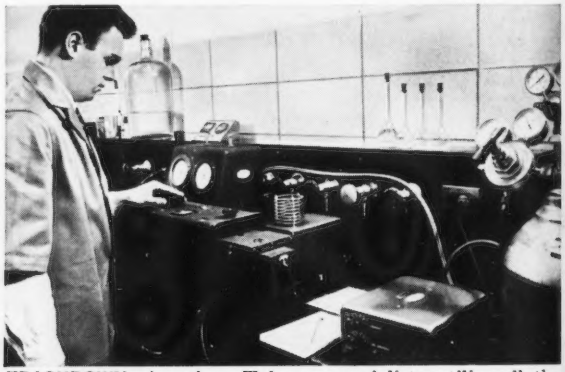


IT'S ELEMENTARY, DR. WATSON: Where there's smoke, there are volatile constituents that affect taste. To study them, American Tobacco researchers condense smoke vapors, distill, collect and separate components with the complex apparatus shown here.



HAVE ISOTOPES—WILL TRAVEL: No scientific detective story is complete without radio isotopes. American Tobacco has pioneered in radiological studies of tobacco. In this new, ultramodern laboratory, such studies as raising tobacco in a radioactive CO_2 atmosphere are conducted for test purposes.

THE HEAT'S ON: To answer such vital questions as the temperature and the combustion products formed at the burning zone in tobacco, the research laboratory is equipped with X-ray equipment (left), tobacco-burning equipment (center) and temperature-recording device (right).



TRACKDOWN: American Tobacco specialists utilize all the important analytical instruments now available to test and examine tobacco and materials used in tobacco. Here, in one of countless tests, a flame photometer determines mineral constituents of tobacco.

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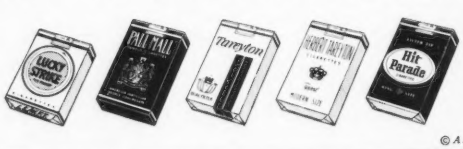

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